APPENDIX B

2003 EXPLANATION OF SIGNIFICANT DIFFERENCES FOR

THE VERONA WELL FIELD SUPERFUND SITE

BATTLE CREEK, MICHIGAN

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LIST OF ATTACHMENTS

I. INTRODUCTION

This Explanation of Significant Differences (2003 ESD) revises the Record of Decision (ROD) for the Verona Well Field (VWF) Site, which was issued by the United States Environmental Protection Agency (EPA) on June 28, 1991. EPA's 1991 ROD addresses contaminated ground-water in an approximate 160 acre area and contaminated ground-water and soil in three source areas: Thomas Solvent Raymond Road (TSRR), the Thomas Solvent Annex (Annex), and the Grand Trunk Railroad Company Paint Shop (Paint Shop) (see Attachments 4 and 5). The VWF Site is located in the northeast portion of the City of Battle Creek, Michigan. If no action was taken, the contaminated ground-water would flow into the Verona Well Field, which continues to be the primary source of drinking water for the City of Battle Creek and the surrounding communities (City), which presently includes approximately 55,000 residents, as well as many businesses, and a number of industrial facilities.

Remedial actions to protect the City water supply, cleanup the aquifer, and cleanup the soil and ground-water at the Annex and Paint Shop are being conducted by a group of private parties called the VWF Group with oversight by EPA and the Michigan Department of Environmental Quality (MDEQ) under unilateral administrative orders issued by EPA. Until May 2002, remedial actions to cleanup ground-water and soil at TSRR were conducted and funded by EPA and the State of Michigan. Since May 2002, the continued operation and maintenance of the TSSR ground-water pump-and-treat system has been implemented and funded by MDEQ with oversight by EPA.

This ESD is being issued, pursuant to Section 117 of the Comprehensive Environmental Response, Compensation and Liability Act, and Section 40 CFR 300.435(c)(2)(I) of the National Contingency Plan, by EPA following consultation with the MDEQ. This ESD presents to the public an explanation of significant differences in the components of the selected remedy as described in the 1991 ROD, including:

- updating ground-water cleanup objectivies (GW CUOs) and soil cleanup objectives (soil CUOs);
- updating of the list of contaminants of concern and potential contaminants of concern requiring further ground-water monitoring or verification of soil cleanup;
- deletion of the requirement to expand the TSRR ground-water extraction system to capture the formerly highly contaminated ground-water downgradient plume;
- measures to prevent the potential for release of hazardous constituents from the pipeline from the Annex to the Verona Well Field treatment system to comply with requirements in 40 CFR 265.193.

A fundamental change to the remedies, which would require another ROD Amendment, is not being proposed.

The 2003 ESD also presents to the public an updated Site history and status, which includes a description of a cooperative process among the parties closely involved in this site, the VWF Group, the City of Battle Creek, the State of Michigan, and EPA. This process will result in formal agreements between the VWF Group and the City of

Battle Creek, and between the VWF Group and the State of Michigan. These agreements will provide for cooperative development of a Verona Well Field Management Plan, and implementation by the VWF Group of measures to ensure protection of the City of Battle Creek water supply up to a production rate of 30 million gallons per day (mgd), to accelerate source area ground-water cleanup, and to commit that VOCs of Known Concern (see Section V.A of this ESD) will be non-detect at the influent to the City's iron removal plant. While EPA is not a formal party to these agreements, it supports these enhancements to the ROD remedy.

II. SITE HISTORY AND SELECTED REMEDIAL ACTIONS

A. INTERIM REMEDIAL MEASURES: In 1981-1982, 27 of the 30 VWF City production wells, as well as 80 private residential wells were found to be contaminated by a number of volatile organic compounds (VOCs), including benzene, dichloroethanes (DCA), dichloroethylenes (DCE), methylene chloride, trichloroethylene (TCE), perchloroethylene (tetrachloroethylene or PCE), and vinyl chloride (VC).

In 1983, EPA and MDEQ provided bottled water and portable showers to the residents with contaminated private wells. In 1984, EPA approved a ROD for Initial Remedial Measures, which included the following components:

- conversion of a number of City owned production wells into a line of hydraulic blocking wells;
- treatment of the extracted ground-water by air stripping with carbon adsorption treatment of air emissions followed by discharge of the treated ground-water to the Battle Creek River;
- installation of new production wells for the City of Battle Creek capable of providing 6 million gallons per day of potable water.

The objective of the 1984 ROD was to reduce or minimize migration of contaminants into the northern portion of the Verona Well Field, and to provide a sufficient supply of uncontaminated water to meet the City's established needs until the final remedial measures were implemented.

While the blocking well system was operating and providing protection to the City water supply, EPA proceeded with conducting a Remedial Investigation/Feasibility Study (RI/FS) for the Site. EPA determined that the sources of contamination were two facilities operated by Thomas Solvent Company (TSRR and the Annex), and a paint shop operated by the Grand Trunk Western Railroad (Paint Shop). TSRR was used for storage, blending and containerization of solvents, while the Annex was primarily a transfer station. Ground-water contamination had resulted from leakage from containers and underground storage tanks, spillage and direct dumping.

B. TSRR REMEDIAL MEASURES: In 1985, EPA approved a ROD to address contamination from TSRR, which was the most highly contaminated source area. The 1985 ROD included the following components:

- construction and operation of a ground-water extraction system to contain and collect the most highly contaminated ground-water at TSRR and in the vicinity of TSRR;
- construction of a pipe to transfer the extracted ground-water to the existing VWF air stripper/carbon adsorption treatment system for treatment;
- construction and operation of a soil vapor extraction (SVE) system with carbon adsorption treatment of air emissions to remove VOCs from the soils.

These components were constructed and initiated operation by 1987 and 1988.

C. 1991 ROD: EPA continued the RI/FS for the Annex and Paint Shop source areas and for the contaminated aquifer as a whole. The general goals used for assessment of remedial alternatives in the FS included:

- limiting ground-water contamination at the Verona Well Field production wells to levels that meet State and Federal clean up standards for protecting human health;
- reducing ground-water contamination in the entire aquifer to levels that meet State and Federal clean up standards for protecting human health and the environment;
- reducing all soil contamination at the major source areas to concentrations that are estimated to result in exposure rates less than the reference doses for non-carcinogens and a total incremental lifetime cancer risk of 1×10^{-6} for carcinogens;
- reduce all soil contamination at the major source areas to levels that will prevent ground-water at the site from exceeding the State and Federal clean up standards for ground-water.

In 1991, EPA approved the final ROD for the entire Site, which provides for a remedy with the following components:

- continued operation of the existing blocking well system;
- construction and operation of a second line of blocking wells downgradient from the source areas;
- containment and collection of contaminated ground-water at the Annex and Paint Shop source areas;
- treatment of extracted ground-water from the Annex and Paint Shop areas and the blocking wells by air stripping with carbon treatment of air emissions;
- construction and operation of SVE systems to cleanup soils at the Annex and Paint Shop source areas;
- continued operation of the existing ground-water extraction system at TSRR;
- expansion of the ground-water extraction system at TSRR to recover ground-water in the highly contaminated downgradient plume area northwest of TSRR;
- construction of a separate treatment system for extracted ground-water from TSRR (this implied that the pipeline from TSRR to the Verona Well Field

treatment system would no longer be used).

The 1991 ROD also defined site-specific GW CUOs for 18 indicator VOCs and soil CUOs for 14 indicator VOCs (see Tables 16 and 17 of the 1991 ROD). These indicator VOCs were the primary contaminants, with the exception of arsenic, found to present individual incremental risks greater than 1 X 10^{-6} for carcinogens, or to present a risk index greater than one for non-carcinogens. As explained on Table 16 of the 1991 ROD, the selected GW CUO for each indicator VOC was the lowest concentration among the following cleanup goals:

- the concentration estimated to produce an incremental lifetime cancer risk of 1 X 10^{-6} due to ingestion of drinking water in the residential scenario;
- the concentration estimated to produce an exposure rate equal to the reference dose for health effects other than cancer due to ingestion of drinking water in the residential scenario;
- the Safe Drinking Water Act, Maximum Contaminant Levels; and
- the Michigan Act 307, Type B ground-water cleanup criteria.

However, if a resulting GW CUO was less than the method detection limit (MDL) for a VOC, then the MDL became the GW CUO for that VOC. The GW CUOs apply to the entire aquifer.

As explained in Table 17 of the 1991 ROD, the selected soil CUO for each indicator VOC was the lowest concentration among the following cleanup goals:

- the concentration in soil estimated to produce an incremental lifetime cancer risk of 1X10^{-6} based on residential ingestion exposure assumptions;
- the concentration in soil estimated to produce an exposure rate equal to the reference dose for health effects other than cancer due to soil ingestion in the residential scenario;
- concentration in soil that would be expected to leach into ground-water at a concentration equal to the ground-water cleanup goals;
- the Michigan Act 307, Type B soil cleanup criteria.

The ROD also included contingent ground-water and soil CUOs (1991 ROD Table 21) equal to the Michigan Act 307 Type B Cleanup Numbers for potential contaminants of concern as identified in the RI, and required sampling for the potential contaminants of concern every two years.

III. IMPLEMENTATION AND EFFECTIVENESS OF REMEDIAL ACTIONS

A. Interim Remedial Measures: The interim measures were constructed and initiated operation in 1984. The construction and first year of operation was conducted by EPA contractors. Subsequently, the system was operated by MDEQ under a cooperative agreement with EPA.

The City of Battle Creek permanently discontinued usage of several production wells located between the source areas and the blocking well system. In addition, the City of Battle Creek voluntarily minimized pumping of production wells closest to the blocking wells. This usage restriction along with construction of new production wells farther north in the well field has improved the effectiveness of the blocking well system by shifting City water production away from the blocking well line, which reduces competition between the City water pumping and the pumping from the blocking wells. VOC concentrations in production wells north of the blocking well line were reduced to trace levels towards the end of 1984, within a few months of the start of operation.

The City has continued to detect trace levels of VOCs (well below 1991 ROD GW CUOs) in certain production wells nearest the blocking well line. Potential causes of such detection include incomplete capture of contaminants by the blocking wells (possibly exacerbated by higher City water production rates and blocking well down times), and residuals from past contamination.

B. TSRR Remedial Measures:

TSRR Soil Treatment: In 1987, EPA constructed the SVE system at TSRR. EPA operated the SVE system from 1988 until 1992, and removed an estimated 50,000 pounds of VOCs from the soil, and left an estimated 0.5 pounds based on extensive soil sampling conducted by EPA in June 1992. The sampling effort included collection of 104 separate samples from 26 soil borings. The samples were analyzed only for VOCs. Only PCE was detected above the soil CUOs. Semivolatile organic compounds (SVOCs) were analyzed in soils during the RI, but the results were determined to be unuseable. SVOCs were sampled at one depth interval at 25 boring locations in August 1989.

Although soils at TSRR had been well characterized for VOCs, there had been no soil samples collected for analysis of pesticide/PCBs or metals and the SVOC data was limited.[1] In response to this data gap in March 2002, MDEQ collected 2 surface soil samples and seven soil boring samples from some of the formerly most contaminated areas for analysis of the base-neutral fraction SVOCs, pesticide/PCBs and metals (excluding lead). If SVOCs, pesticides, PCBs, and metals are less than the risk-based screening levels in areas that were the most contaminated by VOCs, these parameters

[1] *Five-Year Review Verona Well Field*, EPA, September 2002.

are not considered to be a concern at TSRR. The criteria used were MDEQ soil criteria for protection of drinking water and residential direct contact in Operational Memorandum #18 (June 7, 2000), the EPA Region 9 Preliminary Screening Levels (PRGs) for residential soils, and the EPA Region 9 Soil Screening Levels (SSLs) for migration to ground-water (using the 20 fold dilution/attenuation factor).

The results of the August 1989 soil sampling for SVOCs and the March 2002 soil sampling have been compared to the MDEQ critiera, the PRGs, and SSLs. Metals that exceeded any of these criteria were compared to statewide and site-specific background concentrations. None of the analytical results exceeded both the risk-based criteria and background. It should be noted that lead was not included in the metals analyses, but it is acceptable to screen out lead as a contaminant of concern based on the following factors:

- the PRG and Michigan criteria for inorganic lead is relatively high (400 mg/kg);
- from what is known about the site it appears unlikely that inorganic lead contaminated waste were brought to the site;
- the PRG for tetraethyl lead is very low (0.0061 mg/kg), but, from what is known about the site, it appears unlikely that waste containing tetraethyl lead (such as leaded gasoline) was brought to the site for storage;
- lead was detected at relatively low concentrations at the Annex, which was also operated by Thomas Solvent and probably accepted similar wastes (3.8 to 74.6 mg/kg with an average of 16 mg/kg; which is less than the Statewide Default Background Criteria of 21 mg/kg).

Based on the results of this sampling, EPA has determined that SVOCs, pesticides, PCBs and metals are not contaminants of concern in soil at TSRR. Therefore, completion of the soil remedial action can be evaluated based on the results of the soil sampling for VOCs conducted in 1992. This evaluation is addressed in Section V.A.4 of this ESD.

TSRR Ground-water Extraction: In 1987, EPA constructed and started operation of the TSRR ground-water extraction system. An EPA contractor constructed a separate treatment system for TSRR in 1996 and operated the facility through 1997. At other times, the system was operated by MDEQ under a cooperative agreement with EPA. MDEQ assumed full responsibility for operation and funding of the system in May 2002, in accordance with provisions of the Comprehensive Environmental Response, Compensation and Liability Act.

The system initially included 9 extraction wells pumping approximately 350 gpm (compared to 400 gpm anticipated in the ROD). TSRR ground-water was piped to the air stripper of the main VWF ground-water treatment facility (see Attachment 6). Along Emmett Street to a manhole on Brigden Drive, the pipeline was a 6 inch high density polyethylene (HPDE) 110 force main. Along Emmett Street, this force main was installed within a 30 inch storm sewer. From the Bridgen Drive manhole to the Verona Well Field treatment system (where the pipeline is adjacent to a residential area), the pipeline is an 8 inch SDR11 HDPE carrier pipe inside a 12 inch HDPE 52 casing pipe.

The casing pipe is designed to contain any leakage from the 8 inch carrier pipe and result in a discharge into a sump at the treatment facility. Such discharge has never been observed. The 1985 ROD provided for a ground-water capture zone including the area where total VOCs exceeded 100,000 ug/l, which included much of the source area property and almost the entire Davis Oil property as far westward as W16S (see Attachment 7).

MDEQ believes that the desired capture zone is being achieved by the TSRR pump-and-treat system. In 2000 MDEQ conducted a capture zone evaluation that indicated that, at a cumulative extraction rate of only 160 gpm, ground-water below the entire TSRR source area property and much of the Davis Oil property located west of the source area was likely to be within the capture zone.[2] Water levels collected at Davis Oil Company in 2001, when TSRR was operating at an even lower extraction rate, appear to indicate that ground-water below the entire Davis Oil property extending as far as monitoring well W16S was being drawn into the TSRR extraction system. On the other hand, VAS samples collected in March 2002 from a downgradient temporary monitoring well located between monitoring wells T6 and W16S, contained as much as 165 ug/l of total VOCs. MDEQ is evaluating these results, and working on determining the extraction rates and distributions that are necessary to assure that they achieve full capture of source area ground-water and operate efficiently.

Whether the desired capture zone was achieved in the past is still in question because the extraction well near W16S could not produce more than 5-7 gpm and was shut-down within a few months. In spite of this, flow-line analyses and model calculations conducted in 1996 when the pumping rate was reported to be 250-300 gpm, indicated that the capture zone may have extended 300 feet downgradient and 450 feet side-to-side, which would comfortably include the area near W16S.[3]

The TSRR ground-water extraction system is still in operation, and has been successful in reducing both the size and concentration of the contaminant plume. A number of monitoring and extraction wells show that ground-water has been cleaned up or is close to being cleaned up. The total VOC concentration in the most contaminated monitoring well (B18S) has been reduced from as high as 960,000 ug/l in 1987, to 168 ug/l in 2001. Since initiation of operation of the TSRR ground-water extraction system, it is estimated that over 19,000 pounds of VOCs have been removed by the TSRR ground-water extraction system.[1]

The 1991 ROD provided for expansion of the TSRR extraction system to capture highly contaminated ground-water detected in CH139S in 1989. This was never implemented

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[2] *2000 Annual Performance Monitoring Report for the Thomas Solvent Raymond Road Source Area*, MDEQ.

[3] *Final Current Conditions*, CH2M-Hill, 1996.

possibly because of sampling conducted in December 1992 which indicated that VOC concentrations in CH139S had decreased from 22,300 ug/l in 1989 to 330 ug/l in 1992. W16S is now clean and VOC concentrations in CH139S have continued to decrease.

C. Final Remedial Actions to Protect Well Field and Cleanup Annex and Paint Shop Source Areas:

EPA selected the final remedial actions to protect the well field and cleanup the Annex and Paint Shop in the 1991 ROD. In 1992, EPA issued two Unilateral Administrative Orders (UAOs) to potentially responsible parties requiring design and implementation of the final soil and ground-water remedies to protect the well field and cleanup the Paint Shop and Annex source areas. The potentially responsible parties formed the Verona Well Field Site Remedial Design/Remedial Action Group (VWF Group) to implement the UAOs.

SVE at the Annex and Paint Shop: In 1993, the VWF Group constructed an SVE system at the Annex. Grand Trunk Western Railroad Company (the only potentially responsible party for the Paint Shop) did likewise at the Paint Shop. The SVE system started operating in June 1993. The SVE systems were shut-down in June 1994 because the VOC removal rates had reduced substantially, and it was anticipated that the systems would be reinitiated when the source area pump-and-treat system started operating. The systems have removed an estimated combined total of 7,000 pounds of VOCs. The SVE at the Annex included 18 SVE wells and 7 piezometers. The SVE system at the Paint Shop included 4 SVE wells and 3 piezometers. EPA and MDEQ have approved the *Final Soil Verification Sampling Plan* (SVSP)[4] to fully evaluate the effectiveness of treatment at the Annex and Paint Shop, evaluate whether soil CUOs have been achieved, and determine whether further treatment is needed. The SVSP provides for statistically random sampling for all VOCs of Known Concern (listed later in this ESD) in accordance with MDEQ guidance.[5] It also provides for limited sampling for naphthalene, bis(2-ethylhexyl)phthalate, arsenic, barium, cadmium, chromium, copper, manganese, mercury, vanadium and zinc.

Although VOCs were well characterized in the RI, only one soil sample at the Annex and one at the Paint Shop were analyzed for pesticide/PCBs and metals, and only two at the Annex and two at the Paint Shop were analyzed for SVOCs.[6] In response to this data gap in December 2002, EPA collected soil samples from some of the formerly

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[4] Progressive Engineering and Construction, Inc., January 2001.

[5] *Verification of Soil Remediation (Revison 1)*, MDEQ, April 1991

[6] *Five-Year Review Verona Well Field,* EPA, September 2002. The Phase I RI included a number of SVOC analyses on source area soils, but that data was qualified as usable only to identify detections (quantification was unreliable, and compounds could have been present that were not detected).

most contaminated areas for analysis of SVOCs, metals, cyanide and pesticide/PCBs. Soil samples were collected from nine locations at the Annex and four locations at the Paint Shop.

The soil sampling results were evaluated in the same manner as the TSRR sampling for SVOCs, pesticides, PCBs and metals. The result of this investigation was that EPA determined that no further sampling of Annex or Paint Shop soils was needed for SVOCs, pesticides, PCBs, metals or cyanide. However, it was determined that further ground-water monitoring should be conducted for 1,1,2,2-tetrachloroethane, and dieldrin at the Annex.

Design and Construction Process for Dual Blocking Well System and Annex and Paint Shop Extraction Well System: Between 1993 and 1996, the VWF Group performed the design of the final ground-water remediation system, including:

- upgrading of the original (northern) blocking wells and addition of a southern line of blocking wells (numbered GMBW1 through GMBW8) to form a new dual blocking well system to protect the City well field, and using the two northeasternmost southern blocking wells (GMBW1 and GMBW2) for cleanup of source area ground-water at the Paint Shop;
- an Annex ground-water extraction system;
- connecting the Annex water discharge to the former TSRR pipeline to transport contaminated ground-water to the Verona Well Field treatment system;
- upgrading the existing Verona Well Field treatment system to treat all extracted ground-water from the dual blocking well system and the Annex extraction system; and
- addition of sentinel monitoring wells located north of the northern blocking well line to detect contaminant breakthrough between the northern blocking wells and the City water production wells.

This design was conducted under EPA oversight, and the *Final RD/RA Design Report*[7] was approved by EPA. Monitoring requirements were defined in the *Ground-water and Air Monitoring Plan*.[8] This plan was also approved by EPA. An updated model prepared by Geraghty & Miller, Inc. was used to determine the best placement for blocking and extraction wells, and the pumping rates necessary to achieve containment of the contaminated ground-water.

From September – December 1996, the VWF Group constructed the final ground-water remediation system. When the City constructed the Emmett Street overpass in 1996, a City contractor replaced the 6 inch HDPE pipeline from the Annex to the Brigden Drive manhole including the portion inside the 30 inch storm sewer along Emmett Street

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[7] Maumee Bay Environmental, Inc., September 26, 1994

[8] Geraghty & Miller, Inc., June 20, 1996

with a 4 inch HDPE (SDR 11) pipeline. When the City constructed the iron/manganese removal plant for its drinking water system, a City contractor relocated the pump house for V-22.

Dual Blocking Well System Design and Operational Performance: The EPA-approved design provided for operating the northern blocking wells at an extraction rate of 935 gpm rather than 1450 gpm as was anticipated in the FS. The extraction rate for the southern blocking wells was 1675 gpm, which greatly exceeds the estimate in the FS of 1080 gpm. This higher ground-water extraction rate for the southern blocking wells may result in faster cleanup of the aquifer upgradient from the new blocking wells.

Since December 1996, the VWF Group has been operating the final ground-water remediation system. The treatment system has met all air and water emission treatment requirements. During the first couple years of operation, the VWF Group had trouble with frequent down-times primarily due to wet-well pump problems. This probably resulted in some contaminant breakthrough in the northern blocking wells. The VWF Group implemented actions to reduce down-times and periods of reduced flow. In addition starting in 1999, the VWF Group increased the pumping rates at certain northern blocking wells during May - August to attempt to lessen the potential for breakthrough during this period of high City water pumping.

There have been low-level VOC detections in the sentinel wells for the northern blocking well line and in three seldom-used City production wells located near the northern blocking well line. The City of Battle Creek and MDEQ have expressed concern about the potential that contaminant breakthrough is presently occurring, and that the existing dual blocking well system will not provide sufficient protection to the City water supply at higher pumping rates. In response to this, extensive additional investigations have been conducted in 1999, 2000, 2001, and 2002, and the VWF Group has conducted modeling of performance at higher City water pumping rates.

Annex Extraction System Design and Operational Performance: To cleanup the Annex ground-water, the EPA-approved design provided for initial construction of two extraction wells screened in the upper sandstone aquifer at the downgradient property boundary. These extraction wells were to have a combined optimized extraction rate of 90 gpm. The design also included a contingency for two additional shallow extraction wells if the upper sandstone extraction wells did not produce sufficient draw-down in the sand-and-gravel monitoring wells. Even if the shallow extraction wells are added, the approved design is likely to result in a significant reduction in the source area ground-water extraction rate from the 400 gpm extraction rate that was anticipated in the FS. However, this design is not necessarily inconsistent with the remedy description and project objectives identified in the 1991 ROD.[9]

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[9] The 1991 ROD includes the following definition and objectives for the ground-water remedy for Annex and Paint Shop as follows:

The first quarter water level measurement data at the Annex did not clearly indicate whether ground-water in the sand and gravel aquifer at the Annex was being captured. To address this concern, in 1997 another peizometer was added at the downgradient edge of the Annex. December 1997 water level measurements suggested that the sand and gravel aquifer was being captured, but subsequent water level measurements contradicted this conclusion. In addition, model runs by MDEQ using Geraghty & Miller's model indicated that the sand and gravel aquifer may not be captured. This is a particular concern because most of the VOC contamination at the Annex is in the sand & gravel aquifer. For these reasons, EPA and MDEQ have questioned whether the Annex ground-water extraction system is effective in capturing contaminated ground-water in the sand and gravel aquifer. The VWF Group is currently constructing improvements to the ground-water extraction system, which will include two additional ground-water extraction wells screened across the sand and gravel aquifer and the top of the upper sandstone aquifer.

The ground-water extracted from the Annex[10] is piped to the VWF air stripper initially connecting to the pipeline formerly used by TSRR (a separate treatment system had just been constructed for TSRR). The pipeline was not double-lined where it goes through a 36 inch storm-sewer under Emmett Street. This portion of the pipeline was replaced with a 4 inch SDR11 HDPE pipeline along with the storm sewer in 1996 by the City's contractors during replacement of utilities for construction of the Emmett Street Overpass. Any leak in the line could result in a discharge of VOC contaminated ground-water to the Battle Creek River, and there has been no defined procedure to detect such leaks. A leak in the pipeline occurred in January 2003 and was repaired during the same month.

Paint Shop Extraction System Design and Operational Performance: Rather than extracting an estimated 400 gpm of ground-water using four extraction wells in the source area as was anticipated in the FS, the approved design provides for locating the two northeastern most of the southern blocking wells (GMBW1 and GMBW2) at the property boundary between Grand Trunk and City-owned property for the Verona Well Field (about 1000 feet downgradient from the Paint Shop source area). GMBW1 and GMBW2 are to operate at optimized extraction rates of 225 and 220 gpm, respectively. These extraction rates are much higher than the 135 gpm for each blocking well that

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- collection and treatment of contaminated ground-water at the Annex and Paint Shop source areas (pp. 22 and 38 of ROD Summary);
- capture contaminants in ground-water at the source areas (p. 23);
- "greatly reduce contaminant plume concentrations migrating from the sources" so that, in conjunction with the new blocking well line, the action "would result in cleanup of the downgradient portion of the aquifer" (p. 25);
- address risks by achieving applicable or relevant and appropriate requirements and cleanup goals in the source areas (pp. 19, 29, 32, 38, 39, 40, 41, and Table 16).

[10] EPA and MDEQ have determined that the contaminated ground-water at the site contains listed hazardous waste as defined by the Resource Conservation and Recovery Act.

was anticipated in the FS. The northeastern two blocking wells are meant to meet the objectives for the source area extraction wells.[11] This design is not inconsistent with the remedy description and project objectives identified in the 1991 ROD[9].

PCE detections at monitoring well DEQ8 appear to indicate that VOC contaminated ground-water from the Paint Shop is bypassing GMBW1 and GMBW2 to the east in the sand & gravel aquifer. This is backed up by the results of runs of Geraghty & Miller's ground-water model by MDEQ that indicate that this bypassing is likely to occur. For these reasons, EPA and MDEQ have questioned whether GMBW1 and GMBW2 are effective in capturing contaminated ground-water at the Paint Shop. The VWF Group is currently constructing improvements to the southern blocking well line to ensure capture of the Paint Shop plume. The improvements will include at least one additional southern blocking well screened across the sand and gravel and upper sandstone aquifers. It should be noted that any ground-water that bypasses GMBW1 and GMBW2 should be recovered by the northern blocking well line.

Design of the Treatment System: The approved design provides for a combined extraction rate from the dual blocking well lines and the Annex extraction wells of 2700 gpm. This is considerably less than the rate that was anticipated in the FS of 3330 gpm. As a result of this reduced flow rate, the design engineers found that the wet-well, air stripper, and vapor phase carbon adsorption unit from the IRM could be modified to treat all of the extracted ground-water. This eliminated the need to construct separate new air stripper/carbon absorption units for the southern blocking wells and at each source area, as was anticipated in the FS.

Since the initiation of operation of the dual blocking well / Paint Shop and Annex extraction well system in December 1996, 1100 pounds of VOCs have been removed by the system (no estimate is available for 1984-1996 when operation and monitoring was conducted by MDEQ / EPA). In 2001, because of the low and decreasing VOC concentrations, EPA and MDEQ approved decommissioning of the carbon adsorption treatment of the air stripper emissions, and revising the treatment system to allow discharge of the effluent from the northern blocking well line to the Battle Creek River without treatment. The air treatment was decommissioned in 2001. The bypass of the air stripper for the northern blocking wells was constructed and started operation in May 2003. Effluent from the southern blocking wells and the Annex continue to be treated in the air stripper.

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[11] letter, Geraghty & Miller, Inc., October 12, 1994.

IV. OUTSIDE AGREEMENTS TO IMPROVE OR ENHANCE THE REMEDIAL ACTION

Following completion of construction of the dual blocking well/ Paint Shop source area/ Annex source area pump and treatment system, the City of Battle Creek and MDEQ raised concern about a number of elements of the remedy. The primary concern is that the remedy is not designed to provide protection of the City water supply in case City water production rates increase in the future.[12] Other concerns include: 1. that the rate of source area aquifer cleanup may be prolonged compared to what was anticipated in the ROD and may result in delay in the City's ability to regain full use of their well field; and 2. that the ground-water monitoring may not be adequate to detect contaminant breakthrough into the active City well field. In response to these concerns, the City of Battle Creek, MDEQ, EPA and the VWF Group have been in cooperative discussions since 1997 aimed at development of a overall *Verona Well Field Management Plan*, improved monitoring, and defining system enhancements.

In September 2000, EPA, the City, MDEQ and the VWF Group completed development of an *Interim Commitment*, which was signed by the City and the VWF Group. EPA and MDEQ provided letters supporting the *Interim Commitment*. The major technical provisions of the *Interim Commitment* include:

- the VWF Group will implement enhancements to the 1991 ROD requirements for the dual blocking well system generally by increasing extraction rates as necessary to protect the City water supply at pumping rates up to 30 mgd (monthly average);
- the VWF Group will implement measures to ensure capture of the ground-water contamination from the Paint Shop along the northeastern portion of the southern blocking well line;
- the VWF Group will implement enhancements to Annex and Paint Shop cleanups;
- the parties will develop a list of contaminants of potential concern and update the GW CUOsand soil CUOs;
- the VWF Group shall assure that water at the influent to the City's iron removal

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[12] It should be noted that anticipated potential increases in the City water supply pumping rate of 30 mgd (monthly average) was within the capacity of the City production wells in 1984. The City claims that it should be entitled to protection at a water production rate of at least 30 mgd because its developed wellfield capacity at the time the contamination occurred exceeded 30 mgd. The City has also informed EPA that it has studied other options for production of water and determined that use of the VWF is the City's only viable source of water at the production rate and quality levels necessary to satisfy customer demands. Presently only 5 of the original 30 or more wells are routinely used for water production. The City has 25 production wells, use of 8 of the original wells is restricted by the City because of proximity to the blocking wells, 5 of the original wells were routinely used, and 12 production wells have been added (3 by EPA in 1984, and 9 wells were added by the City at a later date). The wells added in 1984 and after are located in the northern portion of the VWF to reduce interference with the blocking wells.

plant will be "non-detect" for chemicals of actual concern;[13]
- the parties will develop a revised long-term ground-water monitoring plan;
- the City and the VWF Group will adopt a *Verona Well Field Management Plan* to define reasonable joint operating principles for the City's well field and the Group's operation of the dual blocking well system.

At this time, more formal agreements are being negotiated to address the provisions of the *Interim Commitment*. In each case, the agreement will take the form of separate, but complementary, consent decrees. It is EPA's understanding that the enhancements provided for in the *Interim Commitment* will be components of consent decrees between the VWF Group and the State of Michigan, and the VWF Group and the City of Battle Creek. EPA supports the enhancement efforts to ensure protection of the City water supply up to a production rate of 30 mgd, the enhancements to accelerate source area ground-water cleanup, and the commitment that contaminants of actual concern will be non-detect at the influent to the iron removal plant. With the exception of the revised list of Contaminants of Known Concern, Contaminants of Potential Concern, and updated cleanup objectives, the technical provisions of the *Interim Commitment* are consistent with or go beyond the requirements of the 1991 ROD

V. DESCRIPTION OF SIGNIFICANT DIFFERENCES AND THE BASIS FOR THOSE DIFFERENCES

A. CONTAMINANTS OF CONCERN, MONITORING, AND CLEANUP OBJECTIVES

Since 1991, the State and Federal standards and risk-assessment toxicity factors and assumptions applying to ground-water and soil cleanups have changed significantly for many contaminants. Furthermore, additional data is available, and historical data has been comprehensively reviewed. As a result, EPA has concluded that it is appropriate to update the investigation summary, list of Contaminants of Known Concern, Contaminants of Potential Concern, monitoring requirements, GW CUOs and soil CUOs applying to the Site. Therefore, Tables 6, 16, 17 and 21 from the 1991 ROD are replaced with the description in this Section and 2003 ESD Table 1 in Attachment 1.

1. Contaminants of Known Concern, Contaminants of Potential Concern, and Monitoring Requirements: As further described below, Contaminants of Known Concern are contaminants that are either: known to have been released as a result of on-site

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[13] Detections of contaminants at the plant's influent, which are not chemicals of actual concern or which can be attributed to a source other than TSRR, the Annex or Paint Shop or which can be demonstrated to be reflective of naturally occurring local background concentrations, shall not represent non-compliance with this criteria.

disposal activities; or are documented to exceed GW CUOs. Ground-water cleanup of Contaminants of Known Concern is required to the GW CUOs. Contaminants of Potential Concern are contaminants that require further monitoring to evaluate their significance as a ground-water contaminant. Therefore, ground-water monitoring and risk evaluation are required for Contaminants of Potential Concern, but this ESD does not establish cleanup requirements for these contaminants.

ESD Table 1 lists the Contaminants of Known Concern for both soil and ground-water, which include:

- VOCs of Known Concern, which apply both to ground-water in the whole site and to vadose zone soils in all source areas; and
- arsenic, which applies only to ground-water in and possibly downgradient from the Annex source area.

The VOCs of Known Concern are known to have been released as a result of activities at TSRR, the Annex, or the Paint Shop, and will be included in the long-term ground-water monitoring and in the statistical sampling in the SVSP. Compared to the 1991 ROD, carbon tetrachloride has been added as a VOC of Known Concern in ground-water, and vinyl chloride and chloroform have been added as VOCs of Known Concern in soil. The only non-VOC Contaminant of Known Concern is arsenic which exceeds its GW CUO only in the ground-water at the Annex. Arsenic was not found to be elevated in Annex soils and there is no record of disposal of arsenic at the Annex, but arsenic is well documented to be present in Annex ground-water above risk-based concentrations, applicable or relevant and appropriate requirements (ARARs), and background concentrations. Therefore, Arsenic must be included in the long-term ground-water monitoring for the Annex.

ESD Table 1 also identifies a reduced list of Contaminants of Potential Concern in ground-water, which apply only to certain of the three source areas and potentially to ground-water downgradient from these source areas. This list includes only dieldrin and 1,1,2,2-tetrachloroethane at the Annex; and aluminum, iron and sodium at the Paint Shop. Each of these contaminants will be included in the long term ground-water monitoring for the relevant source area unless or until the contaminant is demonstrated not to present a significant human health risk. In general, such a demonstration will require at least three rounds of source area ground-water samples with results less than the most stringent of the criteria and risk goals listed in Table 1, or less than the target detection limit (TDL) if the TDL exceeds the most stringent criteria or risk goal. Filtered samples may be collected for aluminum and iron to help determine their actual concentrations in ground-water. The risk goals and criteria for aluminum, iron and sodium can also be adjusted based on further evaluation of their toxicities.

This is a reduction in the list of Potential Contaminants of Concern compared to the list in Table 21 of the 1991 ROD. This reduced list resulted from a thorough review and evaluation of historical source area ground-water data, and additional soil and ground-water sampling by staff of MDEQ, EPA, and Progressive Engineering and Construction,

Inc (Progressive, the consultants for the VWF Group), and additional ground-water and soil sampling. Ground-water sample results were screened using MDEQ ground-water criteria for protection of drinking water. Soil sample results were screened using the MDEQ soil criteria for direct contact and drinking water protection, the PRGs for direct contact, and the SSLs.

2. UPDATED GROUND-WATER CLEANUP OBJECTIVES (GW CUOs)

ESD Table 1 lists the updated GW CUOs for the Contaminants of Known Concern, including VOCs of Known Concern and arsenic in the Annex source area ground-water and displays the process of deriving them. The derivation uses the same categories of State and Federal standards, and risk-based goals as used in Table 16 of the 1991 ROD. Please note that Table 1 does not identify the Safe Drinking Water Act Maximum Contaminant Level Goals even though they were identified in Table 16 of the 1991 ROD because these goals were not actually used to derive the GW CUOs in the 1991 ROD.

The updated GW CUOs are the lowest of the following standards and risk-based goals, with the following exceptions: if the resulting GW CUO would have been less than the TDL, then the TDL becomes the GW CUO; and for metals if the resulting GW CUO would have been less than the background ground-water concentration, then the background concentration becomes the GW CUO:

- the concentration estimated to cause a 10^{-6} incremental lifetime risk of cancer due to usage of the ground-water for residential purposes (Cancer Risk Goal);[14]
- the concentration estimated to produce an exposure rate equal to the reference dose for health effects other than cancer due to usage of ground-water for residential purposes (Non-cancer Risk Goal).[14]
- the current Safe Drinking Water Act Maximum Contaminant Levels (MCLs); and
- the State of Michigan Part 201 residential ground-water cleanup criteria.[15]

As stated in the 1991 ROD, the GW CUOs apply to the entire aquifer (this includes the Annex, Paint Shop, and TSRR source areas).

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[14] The Cancer and Non-Cancer Risk Goals have been updated from the 1991 ROD using formulas and default assumptions identified in the *Risk Assessment Guidance for Superfund, Volume 1– Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals)* OSWER Directive 9285.7-01B, December 1991. This included standard assumptions to account for potential exposure to VOCs in tap water via inhalation, which was not included in the goals in the 1991 ROD. The goals also were calculated using updated carcinogenic potency factors and reference doses. The calculation procedures and toxicity factors are identified in the November 5, 2002 letter from Progressive.

[15] The Part 201 criteria have replaced the Michigan Act 307 criteria used in Tables 16 and 17 of the 1991 ROD. The applicable criteria are defined in MDEQ, Environmental Response Division Operation Memorandum #18, Revision 1 dated June 7, 2000.

ESD Table 1 includes an updated arsenic GW CUO, which applies only to the Annex source area and potentially to downgradient ground-water. A GW CUO for arsenic is appropriate because arsenic has been demonstrated to exceed the background ground-water concentrations, risk goals and ARARs in Annex source area ground-water. In addition, the high arsenic detections appear to be associated with the area of highest VOC contamination. Just like the VOCs of Known Concern, arsenic in Annex source area ground-water must be reduced below its GW CUO before the Annex source area pump-and-treat system can be discontinued.

ESD Table 1 does not include CUOs for the Contaminants of Potential Concern. These contaminants did not have cleanup requirements in the 1991 ROD. Before adding new or more stringent cleanup requirements, EPA must demonstrate that the requirements are necessary to protect human health or the environment. At this time, EPA is not able to make this demonstration for dieldrin or 1,1,2,2-tetrachloroethane because, although the soil data indicates that there is a potential threat to ground-water, both compounds tend to adsorb to the soil and there is insufficient ground-water data to determine whether or not significant ground-water contamination has occurred.

Aluminum, iron and sodium are different from the Contaminants of Known Concern at the Paint Shop for a number of reasons:

- they are normal constituents of ground-water;
- they are necessary human nutrients;
- their toxic effects are produced only at relatively high doses;
- Ground-water problems from iron and sodium are often caused by area-wide conditions, such as naturally high dissolved iron, salt water intrusion in coastal areas, or impacts from use of road salt;
- Aluminum and iron are major components of aquifer solids, and, as a result, elevated detections of aluminum and iron in ground-water are often from aquifer solids suspended in the ground-water sample;
- The aluminum, iron and sodium salts that are normally in ground-water are not hazardous substances, and it is unlikely that the presence of these metals in ground-water at the Paint Shop resulted from a release of a hazardous substance.
- the areas of high concentration do not appear to be associated with disposal in the former drum pit.

A comparison of the range of aluminum, iron and sodium detections in Paint Shop ground-water with MDEQ ground-water criteria for protection of drinking water criteria from Operational Memorandum #18, and PRGs for tap water is shown in 2003 ESD Table 2 in Attachment 2. Review of Table 2 indicates that there is a large variation of concentrations of these metals in ground-water at the Paint Shop, and that there is a large diversity of opinion regarding the toxicity of these metals. There was only one detection of aluminum from a Paint Shop monitoring well that exceeded MDEQ's criteria (4,200 ug/l in W13), but this detection is well below the Region 9 PRG. It is possible that the elevated aluminum from W13 was actually from suspended solids in

the sample. 9 of the 13 Paint Shop samples exceeded MDEQ's criteria and background for iron, and 6 of the 13 samples exceeded the PRG. However, there was a wide variation in the results from monitoring wells where multiple samples were collected: 610 – 32,800 ug/l in CH140; 220 – 72,900 ug/l in CH145; and 8,500 – 12,000 ug/l in CH146. For each of these monitoring wells, the iron concentrations ranged from less than the PRG to much more than the PRG. This suggests that the differences in iron concentrations are caused by variations in the amount of solids in the samples rather than due to actual variations in iron concentrations in ground-water.

6 of the 13 samples exceeded MDEQ's criteria and background for sodium. Unlike iron, the results of multiple samples from the same well were reasonably consistent, but there were large variations among wells. W13 and CH146I are both close downgradient wells from the former drum pit and have similar VOC concentrations, but sodium was less than 500 ug/l in W13, but was detected at 190,000 – 240,000 ug/l in CH146I. This suggests that the drum pit was not the source of the sodium. A PRG has not been developed for sodium.

Considering the uncertainties about the actual ground-water concentrations, sources and toxicities of aluminum, iron and sodium, EPA is unable to demonstrate a risk from these detections at this time. Therefore, no cleanup requirements are included in this ESD for these metals, but EPA has decided that further monitoring of these metals in Paint Shop ground-water should be conducted. The toxicities of these metals can be further evaluated during the next Five-Year Review.

3. UPDATED SOIL CUOs AND EVALUATION OF ACHIEVEMENT OF SOIL CUOs AT TSRR

ESD Table 1 also lists the updated soil CUOs for the VOCs of Known Concern and displays the process of deriving them.[16] The 2001 soil sampling at TSRR and the 2002 soil sampling at the Annex and Paint Shop demonstrated that SVOC, pesticide, PCB and metal parameters are not present above concentrations of concern in source area soils. For this reason, achievement of the soil CUOs will be determined using only the sampling results for VOCs of Known Concern.

Either total constituent VOC concentrations (total VOCs) or SPLP test results can be used to demonstrate achievement of soil CUOs. The SPLP test can be used because all of the soil CUOs are for protection of ground-water. Because the SPLP test

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[16] As long as the ground-water extraction system for the Annex is operated to capture all on-Site ground-water exceeding the updated GW CUOs, and Grand Trunk implements institutional controls requiring maintenance of industrial land use and prohibiting consumption of ground-water from below the Annex, it will be acceptable for Annex soils to remain at concentrations greater than the updated soil CUOs but less than Michigan criteria for industrial and commercial II, II, and IV from the Part 201 Generic Cleanup Criteria Tables, Revision 1, Environmental Response Division Operational Memorandum #18, June 7, 2000.

provides a more direct indication of the potential for causing ground-water contamination than the total VOC test, if SPLP test results are available then compliance with the soil CUOs shall be determined by comparing the concentration in the SPLP leachate with the GW CUOs. The SVSP, provides the VWF Group with the option to test soil samples using the SPLP if the soil CUOs based on Total VOCs are exceeded.

The derivation of the soil CUOs based on total VOC concentrations uses the same categories of State and Federal standards and risk-based goals as used in Table 17 of the 1991 ROD. The soil CUOs are the most stringent of the following categories of standards and risk-based goals, except that if the resulting soil CUO would have been less than the TDL, then the TDL becomes the soil CUO.

- Twenty times the GW CUO;[17]
- the Michigan Part 201, Soil: Residential and Commercial I criteria for protection of drinking water;[15]
- the concentration estimated to cause a 10^{-6} incremental lifetime risk of cancer due to ingestion of soil by residents;[14]
- the concentration estimated to produce an exposure rate equal to the reference dose for health effects other than cancer due to ingestion of soil by residents.[14]

Please note that ESD Table 1 does not include the cancer risk goals and risk ratio goals for residential soil ingestion, which were in Table 17 of the 1991 ROD, because for the VOCs of Known Concern these goals were always less stringent than the cleanup goals designed for protection of ground-water.[18]

The soil CUOs are not to exceed levels and are intended to prevent additional contamination of ground-water above the ground-water CUOs through leaching of source area soils.[19] However, MDEQ has decided that the soil data should be statistically evaluated to determine whether the soil CUOs are achieved.

As previously mentioned, achievement of the soil CUOs at TSRR can be evaluated by comparing the results of the soil sampling for VOCs conducted by EPA in 1992 with the updated soil CUOs. Perchloroethylene (PCE) was the only VOC with soil sampling results that exceeded its updated CUO. PCE was detected in 69 of the 112 soil sample

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[17] The 20 X GW CUO risk goal for protection of ground-water is the concentration in soil that would result in a concentration in the aqueous phase from an SPLP or TCLP leaching test equal to the ground-water CUOs, assuming that all of the VOCs in the soil leach into the liquid phase. In the SPLP and TCLP tests, the solid phase is leached with an amount of aqueous solution equal to twenty times the weight of the soil sample.

[18] 1991 ROD Table 17; letter, Progressive, November 5, 2002 letter.

[19] 1991 ROD Summary, Section X, p. 38.

locations. The highest PCE concentration at a sampling location was 711 ug/kg.[20] The following table presents data on the PCE detections.

Number of sample locations	104
Range	ND – 711 ug/kg
Number of detections exceeding GW CUO (20 ug/kg)	12
Number of detection exceeding MDEQ Criteria (100 ug/kg)	2 (140 and 711 ug/l)
95% Upper Confidence Limit (UCL) of the Average Calculated by MDEQ	38

By comparing the 95% UCL of the average to the cleanup requirement, MDEQ determined that the MDEQ criteria is met, but that the soil CUO is not met. However, without the 711 ug/kg detection the soil CUO would be achieved using MDEQ's statistical procedure. For this reason and because statistical tests identified the 711 ug/kg detection as a potential outlier, an MDEQ reviewer has advised that further field sampling be conducted in the vicinity of the 711 ug/kg detection. EPA disagrees with this because the 711 ug/kg detection and the other remaining PCE concentrations do not indicate a significant risk to ground-water for the following reasons:

- the soil CUO for protection of ground-water for PCE is conservative because it does not take into account the tendency of PCE to adsorb to soil;
- the PCE concentrations in vadose zone soils are expected to gradually naturally attenuate during the operation of the ground-water extraction system, which is expected to continue for many years;
- if significant PCE does leach to ground-water above ground-water CUOs, then it will be detected in the ground-water monitoring network and, as a result, the ground-water pump-and-treat system will have to operate longer;
- the concentrations of VOCs detected in TSRR monitoring wells appears to be decreasing rapidly rather than plateauing, which suggests that the vadose zone soils are no longer leaching significant concentrations of VOCs.

In addition, no further action is justified for the soil because VOCs have been reduced as much as is practicable using SVE because:

- the SVE system operated for approximately 4 years;
- VOC emission data indicated that the rate of VOC removal had been reduced to very low levels; and
- the soil sampling data indicates that only an estimated 0.5 pounds of VOCs

[20] The 711 ug/kg detection is the average of detections in duplicate samples of 370 and 1053 ug/kg (quantitation estimated for both analyses).

remained in the soil compared to the estimated total of 50,000 pounds that had been removed.

Finally, a considerable cost would be involved in removal of what little PCE remains in the soil. For these reasons, EPA has determined that further soil sampling is unnecessary, and that soil treatment at TSRR is complete.

B. CLEANUP OF DOWNGRADIENT GROUND-WATER PLUME AT TSRR

The 1991 ROD provided for expansion of the TSRR extraction system to capture highly contaminated ground-water detected during 1989 RI sampling of CH139S. It was generally considered that the TSRR downgradient plume area started near the corner of Emmet Street and Raymond Road and extended to the northwest possibly as far the Grand Trunk Railroad tracks (see Attachments 5 and 6). Active ground-water extraction in the TSRR downgradient plume area was never implemented. The purpose of this section of the ESD is to document EPA's conclusion that active ground-water extraction from the TSRR downgradient plume area is no longer a required component of the remedy.

It has been estimated that active ground-water extraction of the downgradient plume area would cost an additional $500,000 for construction of an extraction system and a larger treatment system.[21] It was estimated that ground-water CUOs would be met in the downgradient plume area in 7 years with downgradient plume extraction compared to 20 years via natural attenuation. The same memorandum documented sampling results from December 1992, which indicated that total VOC concentrations in CH139S (which is in the middle of the livestock yard) had decreased from as high as 22,300 ug/l in 1989 to 330 ug/l in 1992. In 2000, the water sample from CH139 only contained 83 ug/l total VOCs. Based on this information, EPA staff believe that as long as the remaining contaminated ground-water in the source area is contained by the TSRR pump and treatment system, the continuing process of migration of the remaining contamination to the southern blocking wells in conjunction with other natural attenuation processes, will result in achievement of the ground-water CUOs and restoration of the aquifer to its beneficial use in the downgradient plume area in an amount of time comparable to the estimates in the 1991 ROD. Therefore, expansion of the TSRR pump and treatment system is not necessary.

C. ADDRESSING THE ANNEX PIPELINE:

Currently a single walled 4 inch SDR11 HDPE pipeline is used to transport contaminated ground-water through a 30 inch storm sewer on its way to the Verona Well Field treatment facility. The storm sewer discharges to the Battle Creek River. Until the last year, there had been no defined procedures to detect leaks of contaminated ground-water into the storm sewer and then into the Battle Creek River.

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[21] See a February 26, 1993 technical memorandum from the EPA contractor, CH2M-Hill, Inc.

To address concern about leaks in the Annex pipeline, the VWF Group proposed the following measures to detect and respond to leaks in the Annex pipeline, which will be incorporated into an updated Operation and Maintenance Manual:

- an annual static pressure test;
- addition of a flow meter to measure instantaneous and totalized flow of Annex ground-water where it enters the Verona Well Field air stripper;
- visual inspection at least three times per week of the following measurements to detect leakage: ground-water flow rates from the Annex recovery wells; Annex flow entering the Verona Well Field Air Stripper; Annex pipeline pressure;
- systematic evaluation at least weekly of at least the following measurements to determine whether the Annex pipeline may be leaking: ground-water flow rates from the Annex recovery wells; and Annex flow entering the Verona Well Field Air Stripper;
- a plan for responding to detection of a possible leak.

The VWF Group has also provided a preliminary evaluation of the impact of a short-term discharge of contaminated ground-water from the Annex to the Battle Creek River.

The VWF Group states that compliance with 265.193 by replacing the Annex pipeline with a double-lined pipe with a leak detection system would be impractical. The VWF Group also stated that they may comply by constructing a separate treatment system for the Annex 5 – 7 years in the future, but indicated that construction of a separate treatment system for the Annex at this time would be unnecessarily expensive.

Because this pipeline transports ground-water containing listed hazardous wastes, it is EPA's policy that the pipeline transport should comply with the requirements of the Resource Conservation and Recovery Act. In this case, EPA considers the requirements of 40 CFR 265.193 to be relevant and appropriate. Specifically, this would require a secondary containment and leak detection system (265.193(f)) unless a variance is approved (265.193(g)). Approval of a variance requires demonstration that either: 1. "an alternative design and operating practices, together with location characteristics, will prevent the migration of hazardous waste or hazardous constituents into the ground water or surface water at least as effectively as secondary containment during the active life of the tank system"; or 2. "that in the event of a release that does migrate into ground water or surface water, no substantial present or potential hazard will be posed to human health or the environment.

EPA and MDEQ are presently reviewing whether the present system with the new leak detection and response measures complies with the substantive requirements of Section 265.193. If the substantive requirements of a variance are not met, the VWF Group would have to comply with the requirements of Section 263.193.

VI. EXPECTED IMPACTS OF THE 2003 ESD

A. UPDATED GROUND-WATER CLEANUP OBJECTIVES

ESD Table 1 shows that the updated ground-water CUOs are not significantly changed from the 1991 ROD CUOs for most of the parameters, including benzene, ethylbenzene, methylene chloride, PCE, TCE, toluene, VC, and xylene. The updated CUOs are less stringent for the following contaminants: 1,1-DCA ; 1,1-DCE, and cis-1,2-dichloroethylene (Cis). A CUO is added for carbon tetrachloride, and the updated CUO is more stringent for chloroform. Arsenic is redesignated as a Contaminant of Known Concern in ground-water instead of a Contaminant of Potential Concern. The GW CUO for arsenic is based on the local background arsenic concentration.

The only potential impact of the changes in CUOs is on the time period required for operation of the blocking well and source area extraction well systems. 2003 ESD Table 3 in Attachment 3 was prepared to help evaluate the significance of the change in the CUOs. Table 3 identifies the maximum contaminant detections in ground-water in certain areas of the site during monitoring conducted in 1999, 2000, and 2001 and calculates the ratios of the maximum detections to the 1991 CUOs and the updated CUOs. The higher this ratio is for a specific parameter, the more likely that this parameter will control the length of time required for operation of a blocking well line or source area extraction well system. However, the actual duration of operation cannot be calculated directly from this ratio. If the ratio is less than 1.0, the concentration was less than the CUO. The areas of the site for which ratios are listed in Table 3 include:

- the northern blocking wells and monitoring wells upgradient from the northern blocking wells (assuming that the bypass of shallow ground-water around the northeastern end of the southern blocking wells will be cut-off in the near future), which are considered relevant to the length of time of operation of the northern blocking wells;
- the southern blocking wells and for monitoring wells upgradient from the southern blocking wells, which are considered relevant to the length of time of operation of the southern blocking wells;
- the Annex extraction and monitoring wells, which are considered relevant to the length of time of operation of the Annex source area extraction well system; and
- the TSRR extraction and monitoring wells, which are considered relevant to the length of time of operation of the TSRR source area extraction well system.

The addition of a CUO for carbon tetrachloride and more stringent CUO for chloroform are unlikely to affect the operating time. During the RI carbon tetrachloride was detected in Paint Shop ground-water and in TSRR subsurface soils, but was not identified as one of the more prevalent nor highly concentrated VOCs. Carbon tetrachloride was detected in TSRR extraction and monitoring well samples in 1987-1988, but has not been detected in more recent sampling. Chloroform also has not been detected in recent sampling, except when attributable to chemicals used for well cleaning.

1,1-DCA and Cis had some of the highest ratios using the 1991 ROD CUOs in all areas of the ground-water remediation system. The less stringent updated CUOs for 1,1-DCA and Cis will result in these parameters becoming relatively unimportant in controlling the duration of the ground-water cleanup. This may result in shortening the duration of pumping, but this is uncertain because other parameters such as PCE are still well above the updated CUOs. Overall, PCE, whose CUO is not being changed, will probably be the most important parameter controlling the duration of the ground-water cleanup. TCE appears to be the next most important parameter, and VC is also important due to its low CUO and because PCE and TCE can degrade to VC. In addition, arsenic may be important at the Annex.

B. UPDATED SOIL CLEANUP OBJECTIVES AND EVALUATION OF COMPLETION OF SOIL TREATMENT AT TSRR

ESD Table 1 shows that the updated CUOs for soils are either approximately equal to or are less stringent compared to the 1991 ROD CUOs. VOCs that may control the pace of soil cleanup that have less stringent soil updated CUOs include: 1,1-DCA; Cis; and PCE The updated CUOs are likely to make it easier to comply with soil cleanup requirements. For PCE, this ESD increases the CUO from 10 to 20 ug/kg. Because some TSRR sampling results exceeded both the 1991 CUO and the updated CUO, this change had only a minor impact on evaluation of completion of soil treatment at TSRR.

C. UPDATED MONITORING AND INVESTIGATION REQUIREMENTS

The historical data review; source area soil sampling for SVOCs, pesticides, PCBs, and metals; the source area ground-water baseline sampling; and background ground-water sampling have assured that all site-related contaminants that may present a significant health threat will be included in the monitoring program while eliminating unnecessary analyses.

D. ELIMINATION OF THE REQUIREMENT FOR DIRECT GROUND-WATER EXTRACTION IN THE TSRR DOWNGRADIENT PLUME AREA

Because very high concentrations of VOCs are no longer present in the TSRR downgradient plume area (generally between monitoring wells W10 and W6), implementing an extraction system for the downgradient plume area would not have provided a significant benefit for the additional $500,000 estimated implementation cost.

E. ANNEX PIPELINE REVISION

A leak in the Annex pipeline occurred in January 2003. As a result of discussions with the VWF Group, specific procedures have been defined to detect and respond to leaks in the Annex pipeline. Therefore, if a leak occurs in the future, it should be detected more promptly and response actions implemented more quickly. If EPA determines

that the present system does not satisfy the substantive requirements for a variance in accordance with 40 CFR 265.193(f), then it is anticipated that compliance with 40 CFR 265.193 would entail considerable capital costs for either: construction of a double walled pipe with a leak detection system to transport water from the Annex to the Verona Well Field treatment system; or construction of a separate ground-water treatment system for the Annex.

VII. SUPPORT AGENCY AND PRIVATE PARTY COMMENTS

MDEQ, the City of Battle Creek, and the VWF Group were involved in the development of this ESD. Their comments and concerns are identified in more detail in documents in the administrative record for this ESD.

VIII. AFFIRMATION OF THE STATUTORY DETERMINATION

EPA believes that the VWF remedy remains protective of human health and the environment. The remedy complies with the Federal and State requirements, which are applicable or relevant and appropriate. In addition, the selected remedy continues to utilize permanent solutions and alternative treatment to the maximum extent practicable for the VWF site.

IX. PUBLIC PARTICIPATION ACTIVITIES

EPA has worked closely with the City of Battle Creek Public Works Department regarding issues addressed in the 2003 ESD. In addition, EPA will post a notice of issuance of this ESD and invite public comments in local newspapers.

An index of the Administrative Record supporting the 2003 ESD is attached. The Administrative Record for this ESD and other EPA decision documents is available for public review at repositories located at the following locations:

Willard Library
7 West Van Buren
Battle Creek, Michigan

U.S. EPA, Region 5, Records Center
77 W. Jackson Blvd., 7th floor
Chicago, Illinois

Comments or questions are invited and can be directed to:

United States Environmental Protection Agency
P-19J
77 West Jackson Blvd.
Chicago, IL 60604

Michigan Department of Environmental Quality
Project Manager – Verona Well Field
Superfund Section, Remediation and Redevelopment Division
Constitution Hall – 3rd Floor South
P.O. Box 30426
Lansing, Michigan 58909

City of Battle Creek
Public Works Department
P.O. Box 1717
Battle Creek, Michigan 49016-1717
Attention: Charles K. Kohs, P.E.

Wm. E. Muno — 9/29/03

William E. Muno
Director Superfund Division

DATE

LIST OF ACRONYMS AND ABBREVIATIONS

Annex:	One of the three areas that are major sources of contamination to the Verona Well Field site. This property is owned by Grand Trunk that was leased to Thomas Solvent Company.
ARARs	Applicable or relevant and appropriate requirements
CH2M-Hill:	CH2M-Hill, Inc. has been EPA's contractor for conducting the RI/FS at the Site, for implementation of remedial actions at TSRR and for oversight of remedial actions by private parties
Cis:	cis-1,2-dichloroethylene
City:	City of Battle Creek
CUO:	Cleanup Objective
1,1-DCA:	1,1-Dichloroethane
EPA:	The United States Environmental Protection Agency
ESD:	Explanation of Significant Differences
Grand Trunk:	Grand Trunk Western Railroad Company
GW CAL	Ground-water Cleanup Objective
IRIS:	EPA's Integrated Risk Information System
HDPE:	High density polyethylene
MCL:	Safe Drinking Water Act Maximum Contaminant Level
MDL:	Method detection limit for a chemical analysis as identified in Tables 16 and 17 of the 1991 ROD
MDEQ:	The Michigan Department of Environmental Quality
mgd:	Water flow rate in million gallons per day
Paint Shop:	One of the three areas that are major sources of contamination to the Verona Well Field site. The Paint Shop was used for Maintenance by Grand Trunk.

PCE:	Perchloroethylene (tetrachloroethylene)
PRG:	Preliminary Remedation Goals developed by Region 9, EPA to screen water or soil data for potential risks from water usage and direct contact with soils
Progressive:	Progressive Engineering and Construction, Inc, a consultant representing the VWF Group
RI/FS:	Remedial Investigation/Feasibility Study
ROD:	EPA's Decision Document Called a Record of Decision
SPLP:	Synthetic Precipitation Leaching Procedure (EPA Method 1312)
SSLs:	Soil Screening Levels developed by Region 9, EPA to screen soil data for its potential to cause ground-water contamination above the PRGs
SVE:	Soil Treatment by Soil Vapor Extraction
SVOCs:	Semivolatile organic compounds
SVSP:	EPA-approved plan to assess achievement of soil CUOs at the Annex and Paint Shop entitled *Final Soil Verification Sampling Plan*, Progressive, January 2001
TCE:	Trichloroethylene
TDL:	Target detection limit, as identified in Table 1 of this ESD
TSRR:	The Thomas Solvent Raymond Road Source Area. TSRR was one of the three areas that are major sources of contamination to the Verona Well Field site.
UAOs:	Two unilateral administrative orders (unilateral means they were issued without agreement from the VWF Group) issued to the VWF Group requiring them to implement the 1991 ROD for the blocking wells, the Annex and Paint Shop.
ug/kg:	Concentration of a Contaminant in Soil in Micrograms of Contaminant per Kilogram of Soil
ug/l:	Concentration of a Contaminant in Water in Micrograms of Contaminant Per Liter of Water (or parts per billion)

VC:	Vinyl chloride
VOCs:	Volatile Organic Compounds
VWF Group:	Grand Trunk and a group of potentially responsible generators who are implementing remedial actions under UAOs with EPA.

2003 ESD TABLE 1: VERONA WELL FIELD, BATTLE CREEK, MICHIGAN
IDENTIFICATION OF CONTAMINANTS OF KNOWN CONCERN FOR SOIL AND GROUND-WATER (GW) MONITORING; IDENTIFICATION OF POTENTIAL CONTAMINANTS OF CONCERN FOR SOURCE AREA GW MONITORING (the relevant source area or areas are identified in parenthesis following the name of the contaminant); IDENTIFICATION AND DERIVATION OF UPDATED GW CUOs, WHICH ARE ALSO THE SOIL CUOs if SPLP LEACHING TEST RESULTS ARE AVAILABLE (by comparing the leachate concentration with the GW CUOs); AND SOIL CUOs FOR TOTAL VOC ANALYSES (which are applicable if SPLP tests are not run)
(Units are in micrograms/liter for ground water and soil leachate, and micrograms per kilogram for soil)

VOC GW AND Soil Contaminants of Known Concern	1991 ROD GW CUO	TDL[1]/ BKGR	GW Cancer Risk Goal[2]	GW Non-Cancer Risk Goal[2]	MCL[3]	Michigan GW Criteria[4]	GW and Soil SPLP CUO[5]
Acetone	700	100	--	768	--	730	730
Benzene	1	1	0.54	14	5	5	1
Carbon tetrachloride	0.3	1	0.26	5	5	5	1
Chlorobenzene	100	1	--	135	100	100	100
Chloroform	6	1	77	77	100	100	77
1,1-Dichloroethane (1,1-DCA)	1	1	--	1008	--	880	880
1,2-Dichloroethane	1	1	0.2	13	5	5	1
1,1-Dichloroethylene	1	1	–	425	7	7	7
cis-1,2-Dichloroethylene (Cis)	1	1	–	77	70	70	70
trans-1,2-Dichloroethylene	100	1	–	154	100	100	100
Ethylbenzene	70	1	--	1,592	700	74	74
Methylene Chloride	5	5	6.2	1,735	5	5	5
Tetrachloroethylene or Perchloroethylene (PCE)	1	1	0.86	275	5	5	1
Toluene	800	1	--	934	1,000	790	790
1,1,1-Trichloroethane	200	1	--	578	200	200	200

ATTACHMENT 1

TABLE 1 CONTINUED							
VOC GW and Soil Contaminants of Known Concern	**1991 ROD GW CUO**	**TDL/ BKGR**	**GW Cancer Risk Goal**	**GW Non-Cancer Risk Goal**	**MCL**	**Michigan GW Criteria**	**GW and Soil SPLP CUO**
1,1,2-Trichloroethane	1	1	0.32	31	5	5	1
Trichloroethylene (TCE)	3	1	2.5	46	5	5	2.5
Vinyl Chloride (VC)	1	1	0.1	79	2	2	1
Xylene (total)	300	3	--	1,896	10,000	280	280
Non-VOC GW Contaminants of Known Concern in Source Area							
Arsenic (Annex only)	0.02	15	0.015	10.95	10	50	15
GW Contaminants of Potential Concern in Source Areas							
Aluminum (Paint Shop only)	NONE	1,549	--	36,000	--	1,549[6]	Not Established
Iron (Paint shop only)	NONE	8,357	--	11,000	--	8,357[6]	Not Established
Sodium (Paint Shop only)	NONE	122,544	--	--	--	122,544[6]	Not Established
Dieldrin (Annex only)	NONE	0.02	0.0042	–	–	0.11	Not Established
1,1,2,2-Tetrachloroethane (Annex only)	NONE	1	0.055	–	–	8.5	Not Established

TABLE 1 CONTINUED					
Soil VOC Contaminants of Known Concern	**1991 ROD CUO for Total VOCs in Soil**	**TDL for soil analysis[1]**	**20 X GW CUO for Protection of Ground-water[7]**	**Michigan Soil Drinking Water Protection Criteria[8]**	**Soil CUO Total VOCs**
Acetone	14,000	100	14,600	15,000	14,600
Benzene	20	10	20	100	20
Carbon Tetrachloride	10	10	20	100	20
Chlorobenzene	2,000	10	2,000	2,000	2,000
Chloroform	100	10	1,540	2,000	1,540
1,1-Dichloroethane	20	10	17,600	18,000	17,600
1,2-Dichloroethane	10	10	20	100	20
1,1-Dichloroethylene	10	10	140	140	140
cis-1,2-Dichloroethylene	20	10	1,400	1,400	1,400
trans-1,2-Dichloroethylene	2,000	10	2,000	2,000	2,000
Ethylbenzene	1,400	10	1,480	1,500	1,480
Methylene Chloride	100	10	100	100	100
Perchloroethylene	10	10	20	100	20
Toluene	16,000	10	15,800	16,000	15,800
1,1,1-Trichloroethane	4,000	10	4,000	4,000	4,000
1,1,2-Trichloroethane	10	10	20	100	20
Trichloroethylene	60	10	50	100	50
Vinyl Chloride	0.4	10	20	40	20
Xylenes (total)	6,000	30	5,600	5,600	5,600

1. The CUO defaults to the number in this column if it exceeds the lowest of the risk goals and ARARs. For organic compounds, this column lists the target detection limits (TDLs) from "Environmental Response Division Operational Memorandum #6, Revision 5, Analytical Method Detection Level Guidance for Environmental contamination Response Activities under Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act", MDEQ, November 16, 1998. For arsenic, aluminum, iron and sodium, this column lists the background ground-water concentrations for the relevant source area determined in Statistical Analysis of VWF Metals Background Data, Progressive, March 6, 2003 (Table 3), because background exceeded the TDLs

2. The Cancer Risk Goals correspond to the 1 X 10^{-6} carcinogenic risk level for lifetime exposure via ingestion and inhalation of the contaminant resulting from residential water usage. Dashed lines mean that the parameter is not considered to be carcinogenic. The Non-Cancer Risk Goals are concentrations in water that would result in an exposure rate equal to the reference dose for health effects other than cancer due to ingestion and inhalation of the contaminant from residential water usage. The calculation procedures and toxicity factors are provided in a letter from Progressive Engineering and Construction, Inc. dated November 5, 2002 except that the oral and inhalation slope factors for tetrachloroethylene were updated as provided for in OSWER No. 8285.7-75, dated June 12, 2003.

3. Safe Drinking Water Act Maximum Contaminant Levels. Dashed lines indicate that no MCL has been established for the parameter.

4. Generic criteria for residential and commerical I drinking water from "Environmental Response Division Operational Memorandum #18, Part 201 Generic Cleanup Criteria Tables, Revision 1", MDEQ, June 7, 2000.

5. This column identifies the CUOs for the ground-water cleanup, and also, if leach test results are available, for soil cleanup by comparing the concentrations in the leachate to the GW CUOs (see Section V.C).

6. The criteria for aluminum, iron and sodium are set equal to background concentrations, in accordance with MDEQ's Operational Memorandum #18..

7. The 20 X GW CUO for protection of ground-water is the concentration in soil that would result in a concentration in the aqueous phase from an SPLP or TCLP test equal to the ground-water CUOs, assuming that all of the VOCs in the soil leach into the liquid phase. In the SPLP and TCLP tests, the solid phase is leached with an amount of aqueous solution equal to twenty times the weight of the soil sample.

8. Generic criteria for drinking water protection for Soil: Residential and Commercial I from "Environmental Response Division Operational Memorandum #18, Part 201 Generic Cleanup Criteria Tables, Revision 1", MDEQ, June 7, 2000.

ATTACHMENT 2

2003 ESD TABLE 2: COMPARISON OF RANGE OF ALUMINUM, IRON AND SODIUM DETECTIONS IN PAINT SHOP GROUND-WATER WITH BACKGROUND, MDEQ HEALTH-BASED DRINKING WATER CRITERIA, AND EPA REGION 9 PRGs FOR TAP WATER (all units in ug/l)

CONTAMINANT	RANGE OF DETECTIONS[22]	BACKGROUND	MDEQ CRITERIA	REGION 9 PRG
ALUMINUM	<50 – 4,200	1,549	300	36,000
IRON	220 – 129,000	8,357	2,000	11,000
SODIUM	<500 – 240,000	122,544	120,000	None

[22] The ranges of detections are from Table 8 of *Source Area Groundwater Metals and SVOCs Assessment Summary Report*, Progressive, May 23, 2003. However, the following samples were not included:

- samples from GM7 because ground-water flow is upward from the lower aquifer in these wells and, as a result, this well would not be impacted by releases at the Paint Shop;
- samples from PS-PBB-1, PS-PBB-2 and PS-PBB-3 because these were temporary wells and probably were not well developed.

ATTACHMENT 3

2003 ESD TABLE 3: RATIO OF MAXIMUM DETECTIONS (SAMPLING FROM 1999 AND 2001) TO 1991 ROD CUOs AND 2003 ESD CUOs
(monitoring wells where no ratios exceeded 5 are not listed)

PARAMETER/ LOCATION	MAXIMUM DETECT (ug/l)	RATIO TO 1991 ROD CUO	RATIO TO 2003 ESD CUO
RESULTS AFFECTING NORTHERN Blocking WELL LINE			
1,1-DCA/ MW DEQ-8A	7.5	7.5	0.009
Cis/ Northern Blocking Well V-24	9.6	9.6	0.14
Cis/ Northern Blocking Well V-25	15	15	0.21
Cis/ MW DEQ-7	14	14	0.2
Cis/ MW DEQ-8A	12	12	0.17
PCE/ Northern Blocking Well V-27	7	7	7
PCE/ MW DEQ08A	6.5	6.5	6.5
PCE/ MW DEQ-8B	20	20	20
TCE/ MW DEQ-8A	9.1	3	3.6
TCE/ MW GM-8	7.6	2.5	3
RESULTS AFFECTING SOUTHERN Blocking WELL LINE			
1,1-DCA/ Southern Blocking Well GMBW-06	5.2	5.2	0.006
1,1-DCA/ MW W-6I	21	21	0.02
Cis/ Southern Blocking Well GMBW-04	7.1	7.1	0.1
Cis/ Southern Blocking Well GMBW-05	13	13	0.2
Cis/ Southern Blocking Well GMBW-06	48	48	0.7
Cis/ Southern Blocking Well GMBW-07	42	42	0.6
Cis/ MW CH-105I	13	13	0.2
Cis/ MW CH-150I	98	98	1.4
Cis/ MW W-4I	50	50	0.7
Cis/ MW W-8I	200	200	3
Cis/ Paint Shop Well W-13	5.4	5.4	0.08

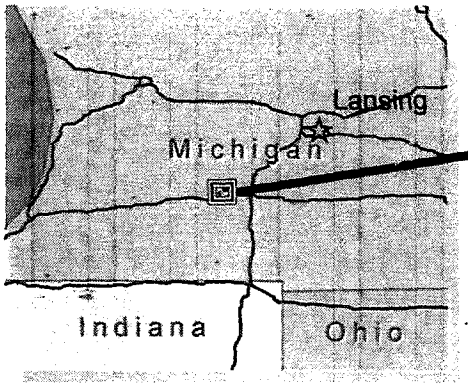
Cis/ Paint Shop Well W-14	6.8	6.8	0.1
PCE/ Southern Blocking Well GMBW 01	8.2	8.2	8.2
PCE/ Paint Shop Well CH-140I	4.5	4.5	4.5
PCE/ MW CH-144S	4.6	4.6	4.6
PCE/ MW CH-144I	7.4	7.4	7.4
PCE/ Paint Shop Well CH-145I	700	700	700
PCE/ Paint Shop Well CH-146I	5.6	5.6	5.6
PCE/ MW CH-150I	10	10	10
PCE/ MW W-8I	15	15	15
PCE/ Paint Shop Well W-13	83	83	83
PCE/ Paint Shop Well W-14	450	450	450
TCE/ Southern Blocking Well GMBW-06	10	3.3	4
TCE/ Southern Blocking Well GMBW-07	8.6	2.9	3.4
TCE/ MW CH-150I	11	3.6	4.4
TCE/ MW W-6I	120	40	48
TCE/ MW W-8I	33	11	13
TCE/ Paint Shop Well W-13	8.3	2.8	3.3
TCE/ Paint Shop Well W-14	8.6	2.6	3.4
VC/ MW CH-150I	28	28	28
VC/ MW W-8I	38	38	38
RESULTS AFFECTING ANNEX EXTRACTION SYSTEM			
Arsenic / B-8S	350	23,000	23
Arsenic/ B-9S	52	350	3.5
Arsenic/ B-25S	140	9,300	9.3
1,1-DCA/ MW B-25	20	20	0.2
Cis/ Extraction Well GMA-1D	86	86	1.2
Cis/ Extraction Well GMA-2D	5.8	5.8	0.08
Cis/ MW-1	7.7	7.7	0.11
Cis/ MW B-8S	500	500	7.1
Cis/ MW B-09	660	660	9.4

Cis/ MW B-25	550	550	7.9
Cis/ MW GMA-9	23	23	0.3
Ethyl benzene/ MW B-8S	2000	28	27
PCE/ Extraction Well GMA-1D	26	26	26
PCE/ Extraction Well GMA-2D	17	17	17
PCE/ MW MW-2A	83	83	83
PCE/ MW MW-3	81	81	81
PCE/ MW B-8S	500	500	500
PCE/ MW B-09	44	44	44
PCE/ MW B-25	3500	3500	3500
PCE/ MW GMA-9	180	180	180
TCE/ Extraction Well GMA-1D	13	4.3	5.2
TCE/ MW MW-2A	10	3.3	4
TCE/ MW B-8S	150	50	60
TCE/ MW B-09	26	8.6	10
TCE/ MW B-25	890	300	360
TCE/ MW GMA-9	87	29	35
VC/ Extraction Well GMA-1D	8.2	8.2	8.2
VC/ MW B-09	610	610	610
Xylenes/ MW B-8S	1800	6	6.4
RESULTS AFFECTING TSRR EXTRACTION SYSTEM			
Cis/ EW-6	1002	1002	14
PCE/ MW B-18S	73	73	73
TCE/ EW-6	29	9.6	12

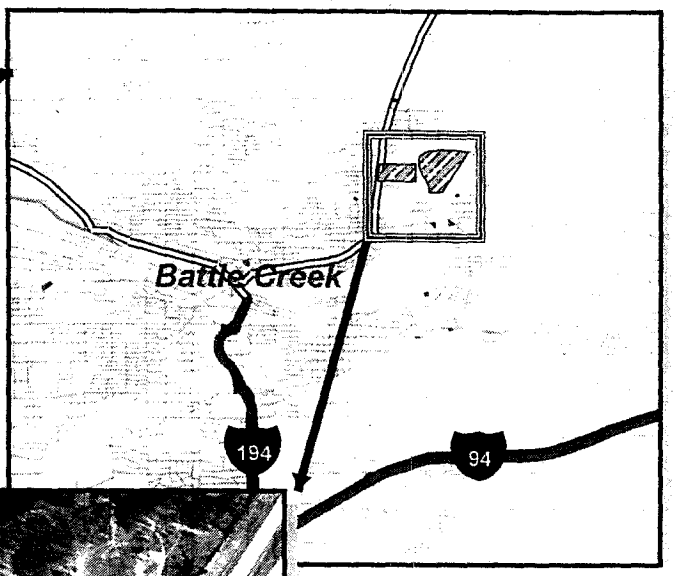
ATTACHMENT 4

Verona Well Field Superfund Site
Calhoun County, Michigan

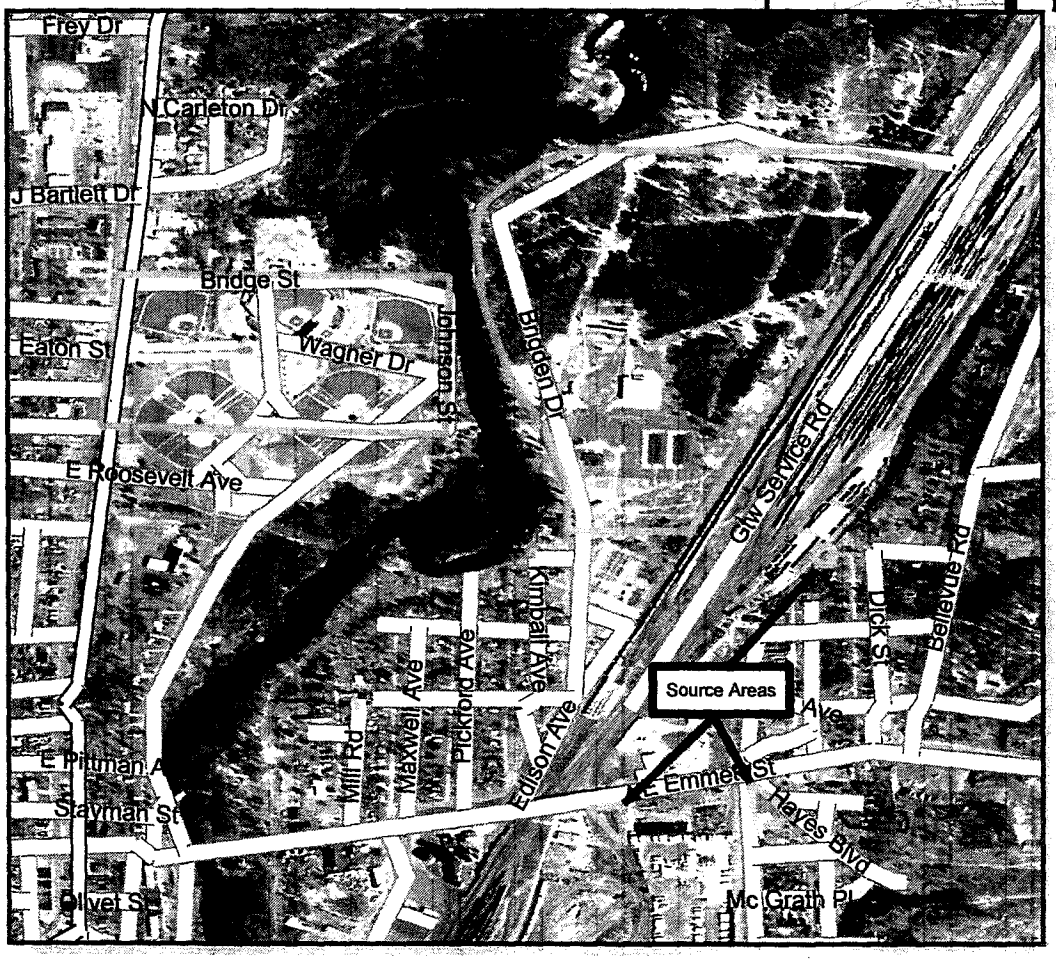
1) State



2) City of Battle Creek



3) Verona Well Field Superfund Site



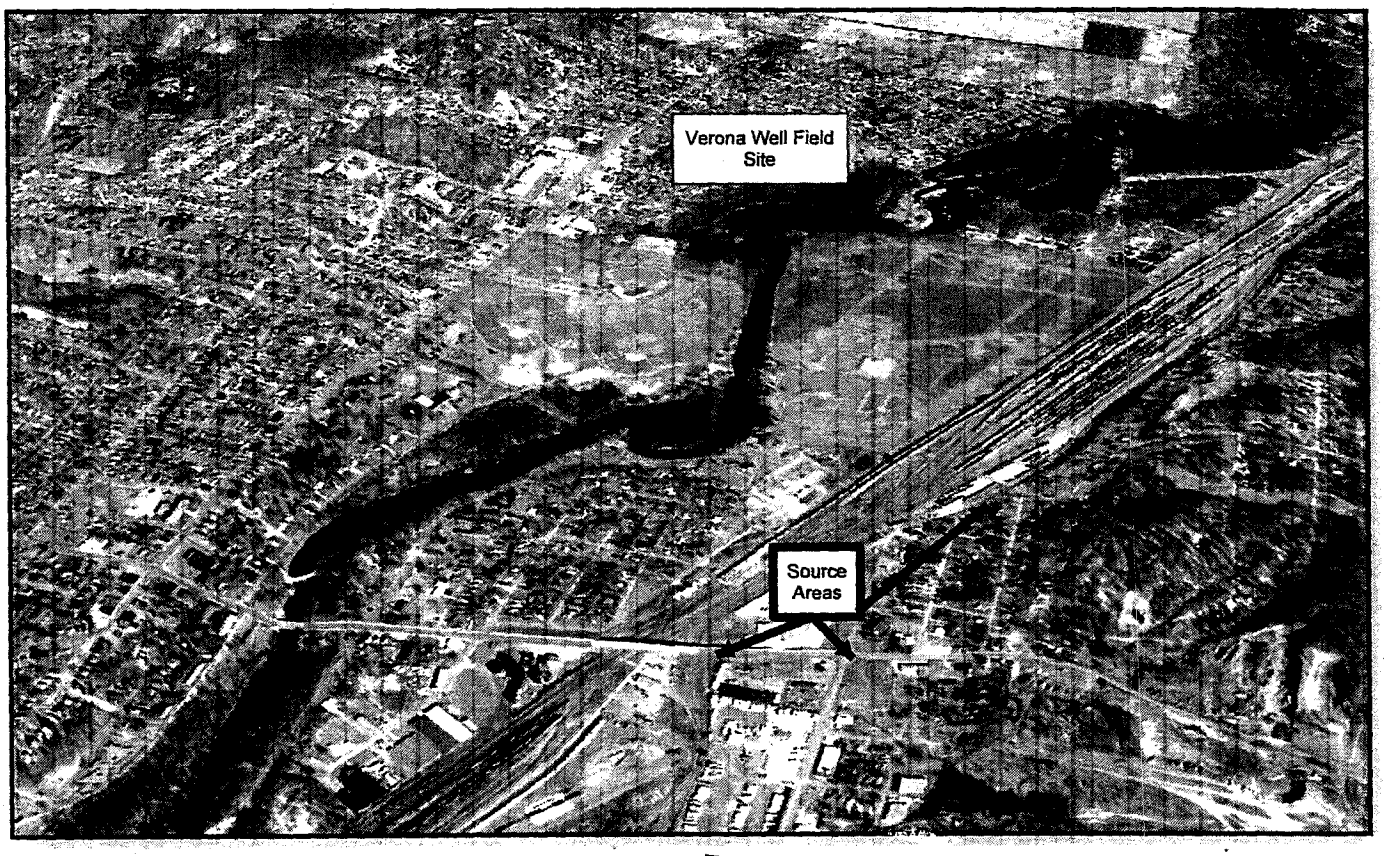
SEPA Region 5 Superfund GEOS

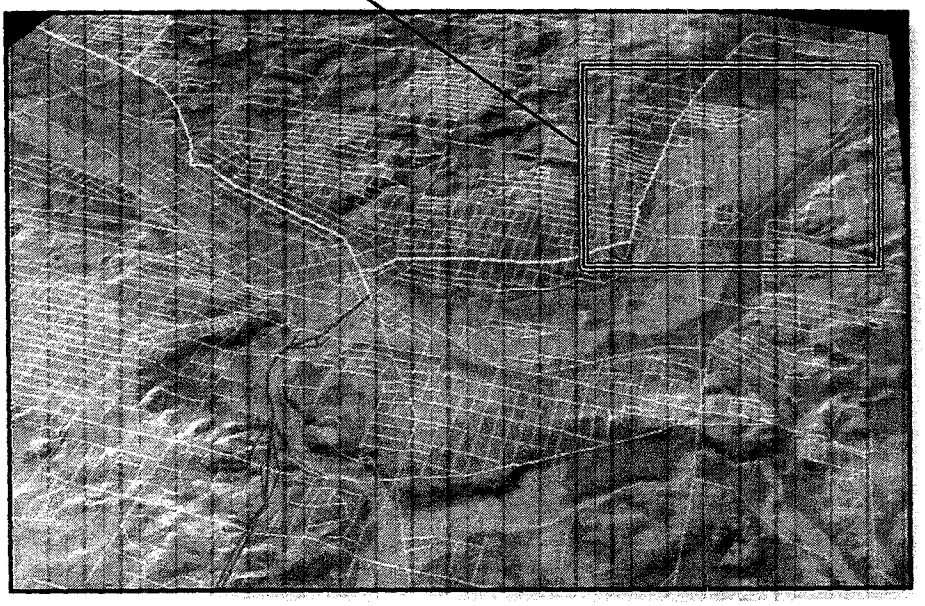
Plot created by David Wilson U.S. EPA Region 9/19/2002
Color Infra-Red Image Date: 4/8/1998

Figure 1

ATTACHMENT 5

Verona Well Field Superfund Site
3D Surface Terrain Model





Legend

Elevation Feet

- 980 - 1004
- 956 - 980
- 933 - 956
- 909 - 933
- 886 - 909
- 862 - 886
- 839 - 862
- 825 - 839
- 792 - 825

N

Figure 2

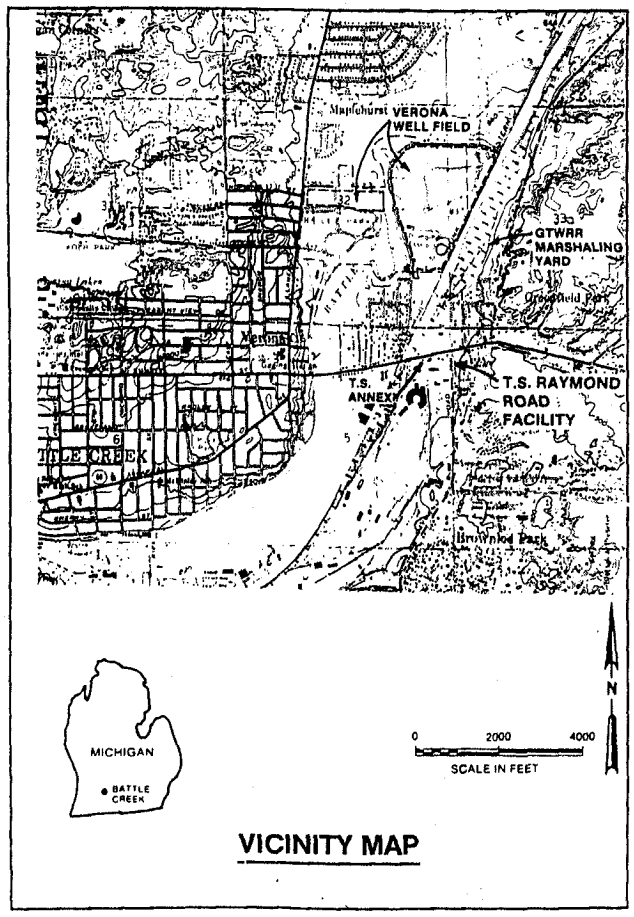
EPA Region 5 Superfund GEOS

Plot created by David Willson U.S. EPA Region 5 on 9/4/2002
B&W Image Date 4/5/1998

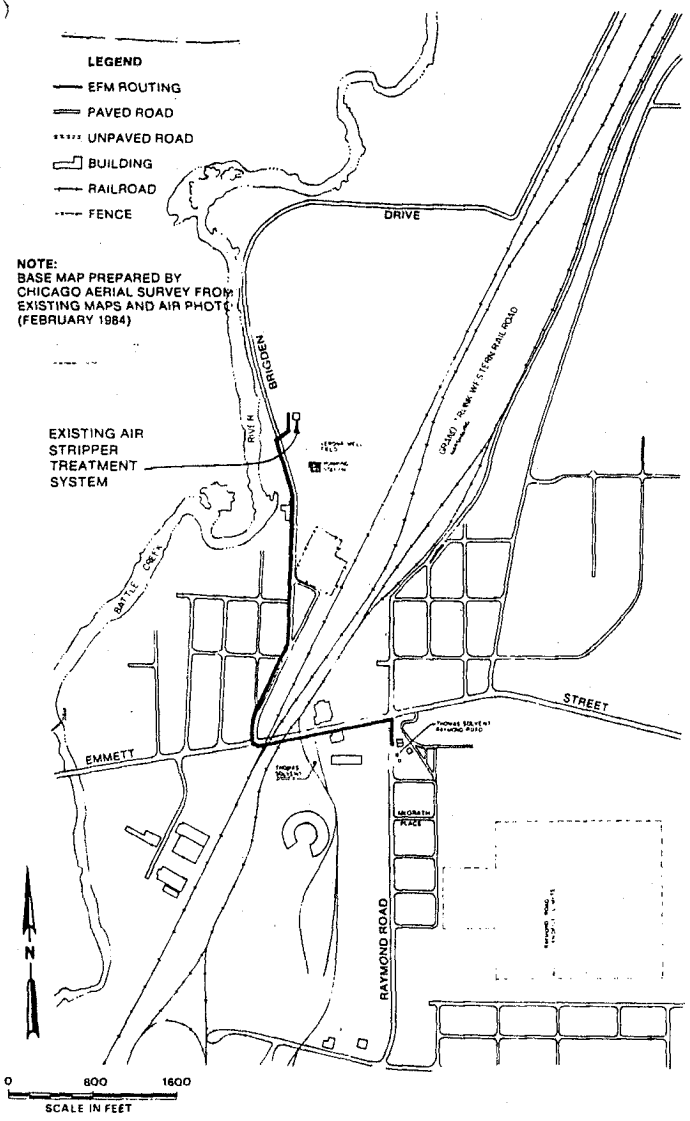
ATTACHMENT 6

REMEDIAL ACTION EXTRACTION WELL S

BATTLE CREEK, MICHIGAN



VICINITY MAP



EXTRACTION WELL FORCE MAIN (EFM) ROUTING

INDE

CH2M HILL	DSGN I.M. SCHLABACH DR I.M. SCHLABACH CHK A.R. AMOTH APVD A.R. AMOTH	NO.	DATE	REVISION	BY	APVD	**REUSE OF DOCUMENTS** THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF CH2M HILL AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CH2M HILL ©CH2M HILL	VERIFY SCALES BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.	THOMAS SOLVENT RAYMOND ROAD FACILITY **REMEDIAL EXTRACTION WELL SYSTEM** BATTLE CREEK, MICHIGAN	C

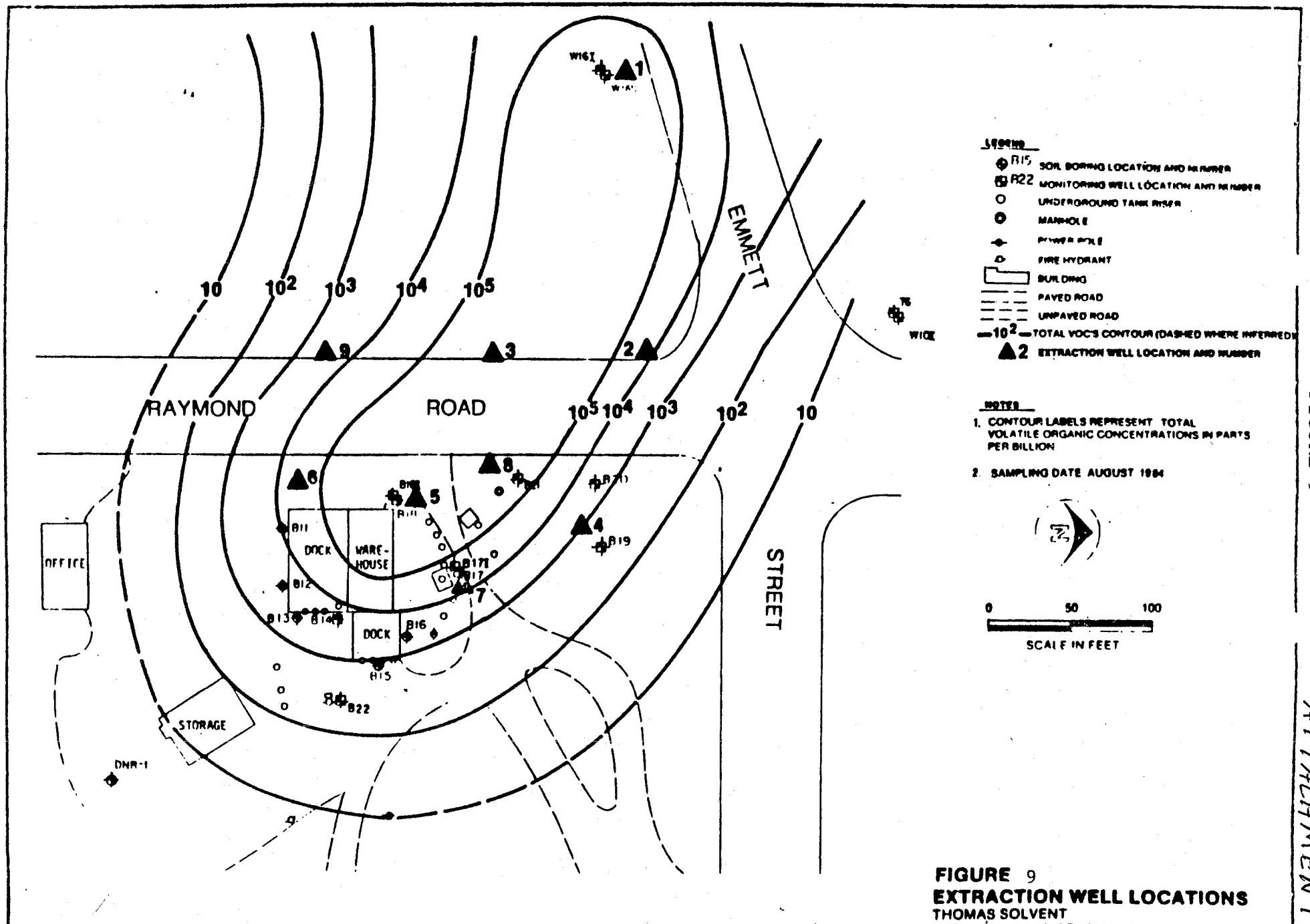


FIGURE 9
EXTRACTION WELL LOCATIONS
THOMAS SOLVENT
RAYMOND ROAD FEASIBILITY STUDY

FIGURE 9

ATTACHMENT 7

ATTACHMENT 8

U.S. ENVIRONMENTAL PROTECTION AGENCY

ADMINISTRATIVE RECORD
FOR
VERONA WELL FIELD
REMEDIAL ACTION
BATTLE CREEK, MICHIGAN

UPDATE #3
SEPTEMBER 26, 2003

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	06/00/88	CH2M Hill	U.S. EPA	Thomas Solvent Raymond Road Groundwater Extraction Well Treatment System Monitoring Report	
2	08/25/89	Danko, J., CH2M Hill	Ferrier, D., MDNR	Letter re: Soil Vapor Extraction Emissions Control at the TSRR Facility	
3	12/00/89	Black & Veatch, Engineers-Architects	City of Battle Creek	Report on Water Supply Needs Verona Wellfield Protection Plan for the City of Battle Creek	
4	02/16/90	Danko, J., Ch2M Hill	File	Memorandum re: Results of the Second Round of Soil Sampling at the TSRR Facility	
5	04/00/91	U.S. EPA	File	Performance Evaluation Report for the Thomas Solvent Raymond Road Operable Unit at the Verona Well Field Site	
6	09/12/91	Boersma, P., CH2M Hill	Geurriero, M., U.S. EPA	Memorandum re: Air Injection and Sparging Pilot Tests at Thomas Solvent Raymond Road	
7	01/22/92	Boersma, P., CH2M Hill	M. Martin & B. Haubold, U.S. EPA	Memorandum re: Operation of SVE System During 1992 at Thomas Solvent Raymond Road	
8	02/20/92	Ullrich, D., U.S. EPA	Hupp, C., Bodman, Longley & Dahling	Administrative Order for Remedial Design and Remedial Action re: the Verona Well Field Site w/ Cover Letter	
9	05/07/92	Ullrich, D., U.S. EPA	Ponitz, J., Grand Trunk Western Railroad Company	Administrative Order for Remedial Design and Remedial Action re: the Verona Well Field Site w/ Cover Letter	

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
10	08/31/92	Boersma, P., CH2M Hill	Guerriero, M., U.S. EPA; B. O'Brien & N. Leeman, MDNR	Memorandum re: Review of Nitrogen Sparging at Thomas Solvent Raymond Road	
11	10/30/92	Boersma, P., et al., CH2M Hill	Guerriero, M. & B. Haubold, U.S. EPA	Memorandum re: Draft Analytical Data from Performance Objective Soil Sampling at TSRR	
12	02/26/93	Boersma, P., CH2M Hill	Guerriero, M. & B. Haubold, U.S. EPA	Memorandum re: Report on the TSRR Groundwater Groundwater Extraction System and Assessment of the Downgradient Plume at the Verona Well Field Site	
13	04/07/93	Morello, B., Geraghty & Miller, Inc.	Haubold, W., U.S. EPA	Blocking Well Phased Approach Technical Memorandum w/ Cover Letter	20
14	07/13/93	Geraghty & Miller, Inc.	Grand Trunk Western Railroad Company & Verona Well Field RD/RA Group	SVE Systems Final Design Report for the Verona Well Field Superfund Site (Revision to June 3, 1993 Report)	
15	08/13/93	Geraghty & Miller, Inc.	Grand Trunk Western Railroad	Draft Final Remedial Design/Remedial Action Work Plan for the Grand Trunk Western Railroad Paint Shop	
16	08/13/93	Geraghty & Miller, Inc.	Verona Well Field RD/RA Group	Draft Final Remedial Design/Remedial Action Work Plan for the Thomas Solvent Company Annex	
17	09/01/93	Geraghty & Miller, Inc.	Grand Trunk Western Railroad Company & Verona Well Field RD/RA Group	Annex and Paint Shop SVE Systems Monthly Operating Report for July 15-August 16, 1993 for the Verona Well Field Superfund Site	
18	09/02/93	Geraghty & Miller, Inc.	Verona Well Field RD/RA Group	Blocking Well Technical Memorandum No. 2 for the Verona Well Field Superfund Site	
19	09/?9/93	CH2M Hill	U.S. EPA	Remedial Action Report for the Thomas Solvent Raymond Road Source Area	

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
20	10/00/93	Geraghty & Miller, Inc.	Verona Well Field RD/RA Group	Quality Assurance Project Plan for Remedial Design/ Remedial Action Activities at the Verona Well Field Site (Revision to February 1993 QAPP)	
21	10/01/93	Geraghty & Miller, Inc.	Grand Trunk Western Railroad Company & Verona Well Field RD/RA Group	Annex and Paint Shop SVE Systems Monthly Operating Report for August 17-September 15, 1993 for the Verona Well Field Site	
22	10/15/93	Geraghty & Miller, Inc.	Verona Well Field RD/RA Group	Annex Groundwater Recovery System Preliminary Design Design Report for the Verona Well Field Site	
23	11/05/93	Geraghty & Miller, Inc.	Grand Trunk Western Railroad Company & Verona Well Field RD/RA Group	Annex and Paint Shop SVE Systems Monthly Operating Report for September 16-October 15, 1993 for the Verona Well Field Site	
24	11/16/93	Plomb, D., CH2M Hill	Guerriero, M., U.S. EPA	Memorandum re: Review of Blocking Well System at the Verona Well Field Site	
25	11/30/93	Geraghty & Miller, Inc.	Grand Trunk Western Railroad Company & Verona Well Field RD/RA Group	Annex and Paint Shop SVE Systems Monthly Operating Report for October 16-November 15, 1993 at the Verona Well Field Site	
26	12/22/93	Ohland, C., & P. Boersma, CH2M Hill	Guerriero, M., U.S. EPA	Memorandum re: Inspection Report for PRP Soil Vapor Extraction Operations at the Verona Well Field Site	
27	1993	Geraghty & Miller, Inc.	Guerriero, M., U.S. EPA	Monthly Progress Reports for the Period January-December 1993 for the Verona Well Field Paint Shop and Annex	33
28	01/03/94	Geraghty & Miller, Inc.	Grand Trunk Western Railroad Company & Verona Well Field RD/RA Group	Annex and Paint Shop SVE Systems Monthly Operating Report for November 16-December 15, 1993 for the Verona Well Field Site	

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
29	01/03/94	Harris, W., U.S. EPA	Mayka, J., U.S. EPA	Memorandum re: Partial Approval of the Second Revision to the QAPP for the RD/RA Activities at the Verona Well Field Site	
30	01/31/94	Egg, M. & G. Rorech, Geraghty & Miller, Inc.	Guerriero, M., U.S. EPA	Letter Re: Soil Vapor Extraction Systems at Annex and Paint Shop at the Verona Well Field Site	35
31	03/22/94	Hupp, C., *Bodman, Longley & Dahling*	U.S. EPA	Verona Well Field RD/RA Group Petition to Amend the June 1991 ROD and Request for §121(c) Five-Year Remedy Review for the Verona Well Field Site: Volumes I-II (Petition, Exhibits and Appendix)	
32	03/31/94	Hupp, C., *Bodman, Longley & Dahling*	Muno, W., U.S. EPA	Letter re: Verona Well Field RD/RA Group's Petition to Revise the Remedy Under the June 1991 Record of Decision for the Verona Well Field Site	
33	05/05/94	Geraghty & Miller, Inc.	Grand Trunk Western Railroad Company & Verona Well Field RD/RA Group	Annex and Paint Shop SVE Systems Quarterly Operating Report for January 16-April 15, 1994 for the Verona Well Field Site w/ Cover Letter	
34	06/28/94	Geraghty & Miller, Inc.	Grand Trunk Western Railroad Company & Verona Well Field RD/RA Group	SVE Construction Completion Report for the Verona Well Site w/ Cover Letter	
35	09/26/94	Maumee Bay Environmental, Inc.	Verona Well Field RD/RA Group	Final RD/RA Design Report for the Verona Well Field Site	
36	10/11/94	Kovalick, W., U.S. EPA	Bosshard, B., Terra Vac, Inc.	Letter re: Soil Vapor Extraction Project at the Verona Well Field Site, Thomas Solvent Raymond Road Area	

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187	05/09/02	Tsuchiyama, K., City of Battle Creek	Boice, R., U.S. EPA	Letter re: City of Battle Creek's Comments on U.S. EPA's Draft ESD for the Verona Well Field Site w/ Cover Letter	

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